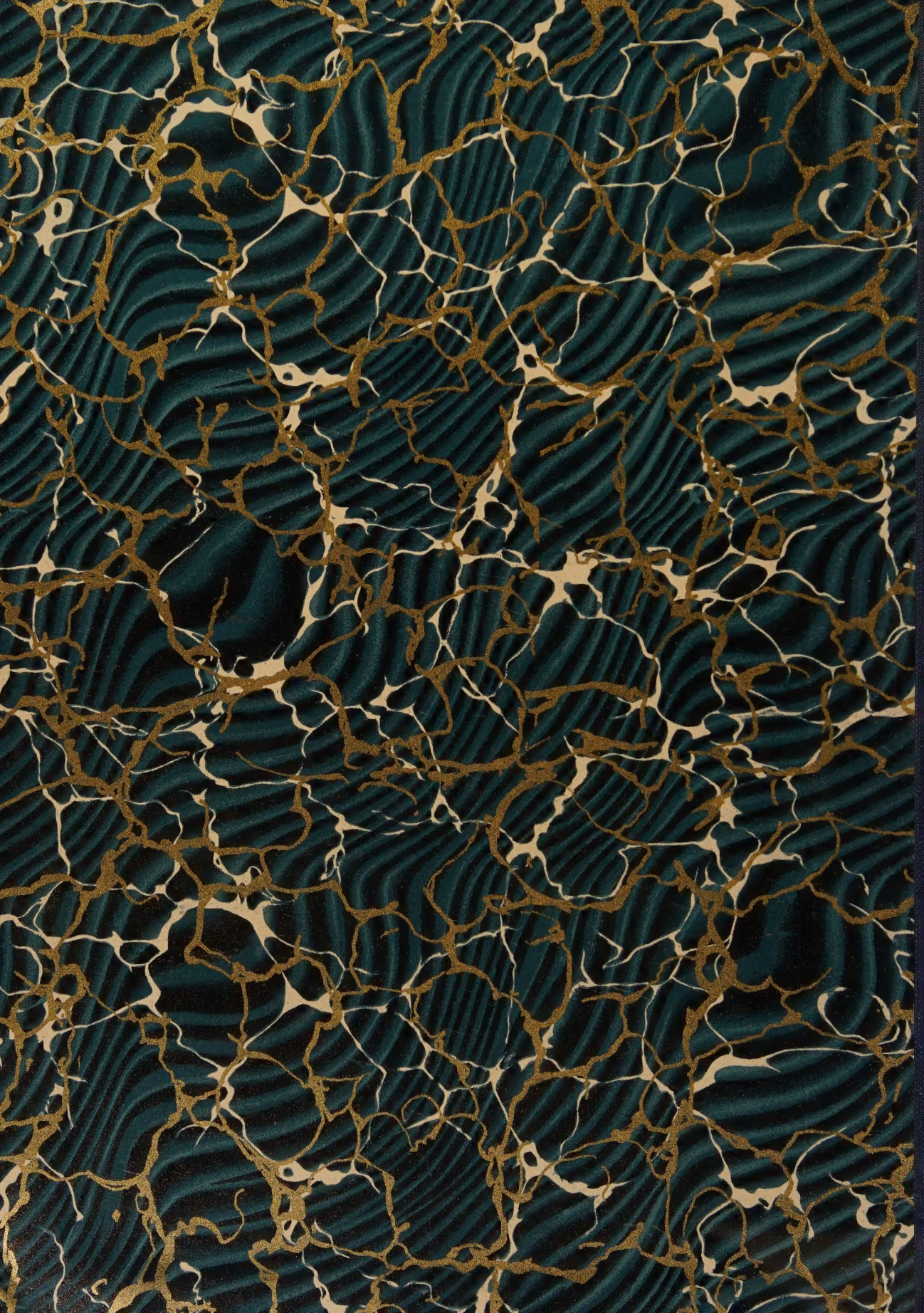

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SECOND EDITION

VOLUME XV

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1924

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the Key to Pronunciation in Vol. I.

ā as in ale, fate.
ȧ " " senate, chaotic.
â " " glare, care, and as *e* in there.
ă " " am, at.
ä " " arm, father.
à " " ant, and final *a* in America, armada, etc.
a " " final, regal, pleasant.
ạ " " all, fall.
ē " " eve.
ė " " elate, evade.
ĕ " " end, pet.
ē̇ " " fern, her, and as *i* in sir, etc.
e " " agency, judgment.
ī " " ice, quiet.
i̇ " " quiescent.
ĭ " " ill, fit.
ō " " old, sober.
ȯ " " obey, sobriety.
ô " " orb, nor.
ŏ " " odd, forest, not.
o " " atom, carol.
oi " " oil, boil.
ōō " " food, fool, and as *u* in rude, rule.
ou " " house, mouse.
ū " " use, mule.
u̇ " " unite.
ŭ " " cut, but.
u̇ " " full, put, or as *oo* in foot, book.
û " " urn, burn.
y " " yet, yield.
B " " Spanish Habana, Córdoba, where it is like English *v* but made with the lips alone.
ch as in chair, cheese.
D " " Spanish Almodovar, pulgada, where it is nearly like *th* in English then.
g " " go, get.
G " " German Landtag = *ch* in Ger. ach, etc.
H " *j* in Spanish Jijona, *g* in Spanish gila; like English *h* in hue, but stronger.
hw " *wh* in which.
K " *ch* in German ich, Albrecht = *g* in German Arensberg, Mecklenburg, etc.
n̲ " in sinker, longer.
ng " " sing, long.
N " " French bon, Bourbon, and *m* in the French Étampes; here it indicates nasalizing of the preceding vowel.
sh " " shine, shut.
th " " thrust, thin.
TH " " then, this.
zh " *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used as in tā'b'l (table), kăz"m (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as G, H, K, N, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on Pronunciation.

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THE NEW INTERNATIONAL ENCYCLOPÆDIA

MAN'ICHÆ'ANS. See MANICHÆISM.

MAN'ICHÆ'ISM. A speculative religious system of western Asia, founded by Mani (q.v.) in the third century of our era. The ideas upon which it was based were mostly Persian (Zoroastrian), but it took some terms from Christianity. The Babylonian elements in it were not so great as was formerly supposed. There may also have been some traces from Buddhism, although this has been questioned by recent critics. The Christianity from which it borrowed was of the Gnostic type (see GNOSTICISM), and Manichæism has been called, not improperly, "the most complete Gnosis." Its western branch came closely in contact with the Church, and appropriated so many Christian ideas and usages that it was sometimes regarded as a heresy, although it was properly a rival system. It differed from Christianity, among other things, in its complete rejection of the Old Testament.

The dualism which Mani taught was radical and materialistic, postulating two opposite original domains, represented respectively by light and darkness, good and evil. They are from eternity contiguous, yet distinct and separate. The kingdom of light included both a heaven and an earth, the latter guarded by good angels (æons). This kingdom has its Good Spirit, or God, whose attributes are set forth in a series of 10 (some say 12) virtues. It is not certain that Mani assumed a second god for his kingdom of darkness, but this kingdom was at least personified, and from it sprang Satan and the evil demons. There is an earth of darkness, analogous to the earth of light, and its five qualities—all obviously evil—are mist, heat, the sirocco, darkness, and vapor. What might be called the equilibrium of the two kingdoms was destroyed by Satan, who overstepped his own boundaries and invaded the light realm. To oppose him God created "primal man," who should be the champion of the invaded kingdom and fight its battles against the evil demons. All this is the prelude to human history.

Mankind came into existence after a long cosmic process, everywhere attended by disturbance and disaster. He is the creation of Satan, who placed in him all the light elements under his control in order to imprison them. Light and dark elements had already become entangled with one another and the conflict had begun before the creation of our present world, but with the advent of humanity it began to wax keener and more tragic. The destiny of the race is to have its light portions finally liberated, which result will accompany the restoration of the lost cosmic order in the universe. Some of the accounts represent the signs of the zodiac as playing an important part in gathering together the scattered particles of light. We also hear of a great final catastrophe, which shall bring the whole process to an abrupt conclusion. The influence of a docetic Christianity appears in Western Manichæism in the notion of the "Jesus patibilis" and "impatibilis." The former term was applied to the light which had become diffused throughout the world. By a peculiar application of the proper name Jesus the sum total of these particles came to be regarded as a being capable of suffering, and actually enduring it, through contact with evil matter. The other term, "Jesus impatibilis," means a sort of phantom, attendant upon the historic Jesus, but not partaker of his human experiences or sufferings. He was rather a messenger descended from the realm of light to aid in the world's redemption. In this work other prophets had taken part, and to crown the series Mani himself appeared, the final prophet of human history. Salvation consists in knowledge of the true nature of the universe and in the final separation of spirit (light) from matter (darkness).

The Manichæans fall into two classes, the *perfecti*, or fully initiated members of the society, and the *auditores*, hearers or novitiates. The hearers constituted by far the larger body, and held the "perfect" in the highest veneration. St. Augustine, before his conversion to Christianity, was for nine years a Manichæan hearer. The elect followed the ascetic rule of life, being distinguished by their threefold "seal" of mouth, hands, and bosom. The *signaculum oris* required abstinence from all defilement through evil speech or animal food; the *signaculum manuum*, abstinence from all avoidable contact with the material world; and the *signaculum sinus*, abstinence from marriage and from all sexual indulgence. The uninitiated were satisfied with a less exacting moral standard, and lived very much as other men and women do.

The Manichæans were organized under a sort of hierarchy, in some respects like that of the Catholic church. Augustine tells us of a graded

system of officers, including 12 teachers, 72 bishops, and a number of elders. Above them all stood one supreme authority, for a long time resident in Babylon, but afterward in Samarkand, who was apparently regarded as the representative of Mani. The worship of the Manichæans was not elaborate. It included, besides the ordinary service of prayer and song, an initiatory rite of baptism, in which oil was used instead of water, and a eucharistic meal. Fasting was emphasized as very important for the elect. An annual festival, called the *Bema*, commemorated the death of the founder, Mani.

From the latter part of the third century Manichæism spread rapidly within the Roman Empire. Among its early adherents were survivors of the Gnostic sects, especially the Marcionites. (See MARCION.) It also won converts from the non-Christian educated classes of Europe, and in Africa even clergy embraced its teachings. By the end of the fourth century it had become one of the three great world systems, competing with Neo-Platonism and Christianity for religious and intellectual leadership. The most notable of its early Christian opponents were Titus of Bostra, Metropolitan Bishop of Arabia, and St. Augustine. The Roman government took measures against the Manichæans almost from the beginning. Diocletian issued an edict against them, commonly dated about 287. Valens (364–378) issued other similar decrees. Manichæans were condemned to exile under Valentinian III (425–455) and to death under Justinian (527–565). But nothing seemed capable of crushing the movement. It survived even the attacks of Islam, and flourished in Asia beyond the tenth century, whence some traces of it came into Europe in the heresies known under the names of the Paulicians, Bogomiles, Cathari, and Albigenses (qq.v.). For references to the literature, see MANI.

MANIÈRE CRIBLÉE, mȧ′nyâr′ krē′blȧ′ (Fr., sieve fashion). Probably the oldest process of engraving upon metal for the purpose of printing. It derives its name from the white dots with which the dark ground of the print is covered, resembling the holes of a sieve. These dots, which form the outlines of the engraving, were beaten into the plate by means of a punch, the parts hollowed out forming a light image on a dark ground. The plates were made of some soft metal, like brass. The earliest examples of prints, of the Bibliothèque Nationale (Paris), are from Cologne, where the art may have originated, in a manuscript dating at latest from 1406. The manière criblée continued to be practiced as late as the first quarter of the sixteenth century, but was never an important factor in the development of engraving.

MAN′IFEST (Lat. *manifestus*, evident), COMMERCIAL. A document, in commercial navigation, delivered to the officer of customs by the captain of a ship, which gives a list in detail of the cargo in his charge, with the names of the places where the goods were shipped and to which they are addressed.

MANIFES′TO (It., manifest). In international law, a declaration or formal statement of policy or intention which it was formerly customary for a belligerent to publish within its own territory or to communicate to other states through diplomatic agents. With modern conditions of intercommunication, such a formal notification has become less imperative, although commercial interests and international courtesy often render it desirable. See DECLARATION OF WAR.

MAN′IFOLD, IN MOTOR VEHICLE. See MOTOR VEHICLE.

MANIFOLD WRITER. See COPYING MACHINES AND PROCESSES.

MANIHIKI ISLAND. See MANAHIKI ISLAND.

MAN′IHOT. A genus of about 80 species of tall herbs and shrubs of the family Euphorbiaceæ, natives of South America. The best-known species are cultivated in warm climates for their underground parts, which yield a starch known as Brazilian arrowroot, and cassava (q.v.). Other species are rubber-producing plants. See Plate of CARNATIONS, ETC.

MANIL′A, *Sp. pron.* mȧ-nē′lȧ. The capital of the Philippine Islands. It is situated on the west coast of the island of Luzon, at the east end of Manila Bay, at the entrance of the river Pasig, in lat. 14° 35′ N. and long. 120° 58′ E. (Map: Philippine Islands, C 3). The city occupies part of an extensive plain on both banks of the Pasig, and is surrounded on the land side by a semicircle of picturesque mountains. It is divided by the Pasig into two parts, the old walled city and the suburbs. The former lies on the south bank of the river and is surrounded by an old wall with bastions and parapets built about 1590. The wall is 2½ miles long and is pierced by six gateways with drawbridges. The use of the drawbridges was discontinued about 1850 and the moats on the land side of the walls were filled with earth in 1905 for sanitary reasons. The city is surrounded by Manila Bay on the west and the Pasig on the north. The walled city contains the principal public buildings, such as the government offices, colleges, the weather observatory, the archbishop's palace, and the cathedral. The aspect of the old city, essentially mediæval, has materially changed since American occupation. Separated from the old city by the Pasig is Binondo, the centre of the commercial as well as of the industrial activity of the metropolis. Here are situated the principal warehouses, cigar and tobacco factories, the business houses of the European trading companies, and the principal shops. North of Binondo lies the suburb of Tondo, where the working population of the capital lives, chiefly in small houses built of cane and palm leaves. San Miguel, situated on an island formed by an arm of the Pasig, is the fashionable suburb of Manila and contains the fine residences of the wealthy merchants and officials.

Several bridges cross the Pasig from the suburbs, the principal being the Bridge of Spain, a handsome stone structure with a number of arches, leading from Binondo. At the south end of this bridge, and stretching along the Pasig outside the city walls, is the Paseo or Plaza de Magallanes, containing an obelisk erected to the memory of the discoverer of the islands. From this plaza a handsome paseo stretches in a semicircle and terminates on the bay front south of the city, where there is a park and promenade called the Luneta, which is lighted by electricity. Most of the streets of Manila are broad and cross at right angles, and have been greatly improved since American occupation. The street railways are operated by electricity, the streets are well lighted and paved, and by a thorough system of drainage the healthfulness of the city has been greatly improved. Among the buildings of Manila the most prominent is the cathe-

dral, destroyed by the earthquakes of 1863, but rebuilt. The customhouse is a handsome building, also rebuilt since 1863. The best buildings are, as a rule, the convents and some of the churches. Manila is the intellectual centre of the entire archipelago, and has, besides the University of St. Thomas (see MANILA, UNIVERSITY OF), the College of San Juan de Letrán, the medical and pharmaceutical school of San José, a general hospital built and operated by the government, a leper hospital, a hospital for contagious diseases, training schools for nurses, normal schools, a large military hospital, a home for convalescents, an insane asylum, and the excellent and spacious hospital of San Juan de Dios. The water supply of the city has been greatly improved since American occupation, the water being brought from the Mariquina River 25 miles away to a large storage reservoir about 200 feet above sea level. The drainage system has also been greatly improved, the sewage being discharged into the bay more than a mile from shore by a pumping system.

The chief manufactures are cigars and cigarettes, furniture, boots and shoes, products of the famous Manila hemp or abaca, and some textiles. Iron foundries, machine shops, and various milling establishments are also flourishing. Manila's future, however, will depend chiefly on its commerce. Its harbor has been greatly improved under American rule, by the construction of breakwaters or jetties inclosing about 350 acres of harbor area and dredging this to a depth of 30 feet, and the construction of steel wharves 650 feet long and about 100 feet wide. The Pasig River has also been dredged to a depth of about 20 feet, and the Manila harbor may now be considered the best and most modern in that part of the Orient. The city has steamship communication with many of the great ports on both sides of and in the Pacific Ocean. The larger commercial houses are conducted by Americans and by Spaniards or other Europeans, while the small trade is mostly in the hands of the Chinese, who are very prominent in the commercial activity of the city. Manila exports mainly sugar, hemp, tobacco and cigars, coffee, dyewoods, and precious metals. It is the greatest hemp market of the world. The imports are rice, cotton goods, chemicals, machinery, metal goods, and wine. The trade is chiefly with China, the United States, and Great Britain, the share of the trade with the United States having greatly increased with the removal of all duties on Philippine products entering the United States and the admission duty free into the Philippines of all domestic merchandise from the United States. The population of Manila and suburbs, according to the census of 1903, was 219,941, of whom 189,782 were Filipinos, 21,230 Chinese, 4389 Americans, 2528 Spaniards, and 1117 other Europeans. In 1910 the population was estimated at 234,400. Manila is the centre of a railway system of 475 miles and with its excellent harbor facilities is the chief entrepôt of the Philippine group. A very large share of the $56,000,000 worth of imports and $53,000,000 worth of exports of the islands enters or leaves this harbor. The city received its new charter of incorporation from the Philippine Commission on July 31, 1901, by which the government is vested in a municipal board appointed by the civil Governor of the islands. There is an excellent school system, established by the Americans after assuming control of the islands.

Manila existed as a palisaded native town under the name of Mainila when it was first visited by the Spaniards. In 1569 Juan de Salcedo, a nephew of Legazpi, the conqueror of the Philippines, made an unsuccessful attempt to found a Spanish colony in the town. In 1571 Legazpi himself appeared in the harbor with a Spanish fleet and was admitted into the town by the two native chiefs, who rendered homage to Spain. Legazpi at once strengthened the fortifications and built a church and a number of houses for the Spaniards, and in the same year a municipal government was inaugurated with great solemnity. The city in 1574 was sacked and burned by Chinese pirates; in 1590 the present permanent fortifications were begun. In 1602 an insurrection of the Chinese residents of the city was put down with great severity, several thousands of the insurgents being killed. The same year the city was blockaded by the Dutch. In 1762 it was captured and sacked by the English, who occupied it until 1764.

Towards the end of the nineteenth century Manila became the centre of secret agitation for the overthrow of Spanish sovereignty. Many arrests were made; on Sept. 2, 1896, 13 prominent Filipino citizens were shot at Cavite, and on December 30 Dr. Rizal was executed at Manila. On Aug. 30, 1897, a skirmish with the insurgents took place on the outskirts of the city, which was then declared under martial law. On May 1, 1898, Dewey destroyed the Spanish fleet in Manila Bay—an event which was the signal for a great uprising of the Filipinos against Spanish rule, under the lead of Aguinaldo, and on August 13 the city capitulated to the American forces. It was placed under a military government and policed by a provost guard of American soldiers. During the winter of 1898–99 the city was practically in a state of siege by Aguinaldo's forces until the actual outbreak of hostilities, which began with an unsuccessful attack of the Filipinos upon the Americans at Manila, on Feb. 4–5, 1899. The actual transfer of the military government to the new civil authorities took place on Aug. 7, 1901. In 1914 the constabulary discovered a well-organized native plot to revolt, with headquarters at Manila. About 30,000 Filipinos were involved. It was frustrated by the arrest of several leaders after an abortive attack on the police in the Botanical Gardens.

Manila has a number of times suffered from earthquakes, the most terrible of which occurred on June 3, 1863, when all the prominent buildings were destroyed and several thousand persons killed. Consult the authorities referred to under PHILIPPINE ISLANDS.

MANILA, UNIVERSITY OF (or UNIVERSITY OF ST. THOMAS). A university in Manila which owes its origin to Philip II of Spain, who in 1585 gave permission for its foundation. In 1601 a seminary for nobles was opened here, and in 1611 the Dominicans, supported by the Archbishop of Manila, established the College of St. Thomas for natives and poor Spaniards. In 1619 the college received papal permission to grant degrees and in 1644 was converted into a university. The present institution, however, dates from 1857 and was built up on the basis of the old. In 1871 schools of medicine and pharmacy were added. The university is now organized on the model of similar American institutions and has faculties of theology, canon and civil law, medicine, pharmacy,

philosophy and arts, and engineering. In 1912 the university had an enrollment of 767 students, of whom 655 were in the colleges of law and medicine.

MANILA BAY. A large and beautiful inlet of the China Sea, running into the southwestern coast of Luzon (Map: Philippine Islands, C 3). It has, roughly, the shape of a triangle with its base line, 37 miles long, forming the head of the bay from southeast to northwest, while its apex is at the entrance, which is 11 miles wide. The depth of the bay from the entrance to the base is 25 miles. The land on both sides of the entrance and along the west shore is high and forested; that on the east and north is low, and the north shore especially consists of the marshy delta of the Río Grande de la Pampanga, which enters the bay through numerous mouths, between which tall reeds grow far out into the shallow water. The greater part of the bay, however, has deep water, with good and ample roadsteads at Manila and Cavite, and for harbor purposes it is the finest in the Far East. The entrance is well lighted by a large lighthouse on Corregidor Island and another on the smaller island of Caballo. The bay connects through the Pasig River at Manila with the large Bay Lagoon in the interior of Luzon. Manila Bay was the scene of the victory of Admiral Dewey over the Spanish fleet on May 1, 1898. See SPANISH-AMERICAN WAR.

MANILA FIBRE, or **MANILA HEMP.** See HEMP, MANILA.

MANIL'IAN LAW. A law proposed at Rome in 66 B.C. by the tribune Gaius Manilius, providing for the recall of the commanders then in Asia, where the Romans were fighting Mithridates, and for the extension of Pompey's power over all the East. Pompey was then in the East, clothed with large powers against the Cilician pirates (see CILICIA); Manilius proposed to give him command against Mithridates also. Cicero made his first address to the people in support of the proposition of Manilius. The speech, *Pro Lege Manilia,* or *De Imperio Cn. Pompeii,* is admirable in form, far superior in this respect to the orations against Catiline. It throws much light also on the operations of the publicani (q.v.).

MANIL'IUS, MARCUS. The supposed name of the author of a Latin poem on astrology entitled *Astronomica.* Nothing is known of his personality, but from the poem itself it is inferred that he lived in the reigns of Augustus and Tiberius. Five books of his poem are preserved, treating of the constellations and their influence on human life. The work is of no great poetic value, but exhibits great learning and diligent research in the works of the best authorities. The writer imitates Lucretius and has much of that author's enthusiasm and power to enliven a difficult subject. There are several editions, including those of Scaliger (Leyden, 1579 and 1600), Bentley (London, 1739), Jacob (Berlin, 1846), and Breiter, with Commentary (Leipzig, 1907–09), and an edition of Book ii by Garrod (Oxford, 1911). There is an English translation by Creech (London, 1697). Consult: Lanson, *De Manilio Poeta* (Paris, 1887); R. Ellis, *Noctes Manilianæ* (Oxford, 1891); Martin Schanz, *Geschichte der römischen Litteratur,* vol. ii, part ii (3d ed., Munich, 1913).

MANIN, mȧ-nēn', DANIELE (1804–57). An Italian patriot. He was born in Venice, May 13, 1804, studied at the University of Padua, and was admitted to the doctorate of laws at the age of nineteen. He was then admitted to the bar, of which his father, Pietro Manin, was an eminent member. After 1831 he became a recognized leader of liberal opinion in Venice. In 1847 his reputation as a political economist was established during the sittings of the scientific congress at Venice. Shortly after he was thrown into prison for a spirited public address against Austrian domination. Previous to the rising against Austria of 1848 Manin was for a second time imprisoned, but when the news came of the revolution in Sicily and of the February revolution in France he was released in triumph by the populace, was placed at the head of the patriotic movement, and was invested with supreme power as President of the restored Republic of St. Mark. The organization of a civic guard and the expulsion of the Austrians from the arsenal were Manin's first public measures. At the same time he prevented the mob from murdering their former oppressors. Manin devoted himself energetically to the organization of the inhabitants for self-defense. For a short time he had to give way to more radical leaders, but was soon recalled. During the invasion of Lombardy by Charles Albert of Sardinia Manin laid down his authority; but on the defeat of the Sardinian army at Novara, March 23, 1849, he resumed power, and was the animating spirit of Venice during the heroic defense of the city for four months against the besieging Austrian army. On August 23 Venice capitulated; but Manin, with 40 of the principal citizens, being excluded from the amnesty, quitted the city. Having lost his fortune in the defense of Venice, he retired to Paris, where he taught his native language, declining innumerable offers of aid. He died there, Sept. 22, 1857. Manin's public career was one of complete unselfishness. Believing as strongly as Mazzini in a republic, he was yet wise enough to see Italy's need, and from his exile in Paris he urged upon his compatriots coöperation with the Sardinian monarchy in effecting the union of Italy.

Bibliography. Rovani, "Di Daniele Manin memoria storica," in *Documenti della guerra santa d'Italia* (Capolago, 1850); Castille, "Manin," in *Portraits politiques au dix-neuvième siècle* (Paris, 1856); Reuchlin, "Daniel Manin," in *Historisches Taschenbuch,* vol. xxxii (Leipzig, 1861); A. Errera, *La vita e i tempi di Daniele Manin* (Venice, 1872); id., *Daniele Manin e Venezia 1804–53* (Florence, 1875); *Daniele Manin e Giorgio Pallavicino: Epistolario politico 1835–57* (Milan, 1877); E. L. H. Martinengo-Cesaresco, *Italian Characters in the Epoch of Unification* (New York, 1901); Ferrari-Bravo and Marloni, *Daniele Manin e i suoi tempi* (Venice, 1904); R. S. Holland, *Builders of United Italy* (New York, 1908). See ITALY; VENICE.

MAN'ING, FREDERICK EDWARD (1812–83). A New Zealand judge, born at Johnville, County Dublin, Ireland. His father emigrated with his family to Tasmania in 1824 and in 1833 young Maning settled among the Maoris of New Zealand. He became a favorite of the natives; was adopted into their tribe; and later he married a Maori wife. He gave good advice to both sides in the wars of 1845 and 1861. From 1865 to 1881 he was judge of the native land courts. A victim of cancer, he returned to England in 1881 and there died. Much credit is due to Maning for the knowledge that has been gained

of the Maoris through his books, *Old New Zealand* (1876; 6th ed., 1906) and *The History of the War in the North with Heke in 1845* (3d ed., 1884).

MAN IN THE IRON MASK, The. See Iron Mask.

MAN'IOC (*Manihot utilissima*). A South American plant, of the family Euphorbiaceæ. Its starchy underground stems are used to make tapioca. See Cassava; Plate of Carnations, etc.

MAN'IPLE (OF. *maniple*, Fr. *manipule*, from Lat. *manipulus*, handful). 1. A narrow strip of silk worn on the left arm by the sacred ministers in a solemn mass. Originally it was a mere linen handkerchief, but since the eleventh century it has been made of the same material and color as the chasuble. When a bishop celebrates mass pontifically he assumes the maniple only at the *Confiteor;* otherwise it is put on in the sacristy with the other vestments. See Costume, Ecclesiastical. 2. In the Roman military organization the legion (q.v.) was divided into 30 maniples, each commanded by a centurion, and consisting of about 100 men in the case of the regular infantry and 40 men among the *velites*, or light-armed skirmishers.

MANIPUR, mä'nê-pōōr'. A native state of northeast India, situated between Assam and Upper Burma, and called by the Burmese Cassay or Kathe (Map: Burma, B 2). Its area is 8456 square miles. It consists chiefly of a deep valley 2500 feet above the sea. The industries are purely agricultural, the chief products being tea, cotton, rice, tobacco, opium, and indigo. The state is administered by a rajah, but has been a political dependency of Assam since 1825. In 1891, during the disputed succession to the throne, the British Commissioner Resident, and several officers were treacherously murdered; a punitive expedition hanged the ringleaders, settled the succession, and resumed the administration under British supervision. Pop., 1901, 283,957; 1911, 346,222, chiefly Hindus. Capital, Manipur.

The natives of Manipur consist of Manipuris proper, Nagas, and Kukis, all of whom are by tradition assigned to a common ancestry. The Manipuris call themselves Meithei, and since their conversion to Hinduism in the beginning of the eighteenth century they claim a Hindu origin. They are of the Mongoloid type of feature and do not resemble the Aryan or Aryanized peoples of Hindustan. Their language is closely allied to the Chin, Lushai, and Kuki tongues. Among the Meithei clan worship of tribal deities and peculiar rain ceremonies prevail, and ancestor worship was probably once in vogue. Each tribe seems to have a rain rite of its own. The Kukis are still migratory, but the Nagas live in permanent villages. Terrace cultivation with irrigation channels occurs in Manipur. The Nagas of Manipur and the mountains to the north are essentially Indonesians, and the Lushai of the south are Nagas mixed with Kyens and Burmese of Arakan. The game of polo was formerly almost peculiar to Manipur and the state was once famous for its breed of ponies. Consult: Grimwood, *Three Years in Manipur* (London, 1891); Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872); Reid, *Chin-Lushai Land* (ib., 1883); Sir James Johnstone, *My Experiences in Manipur and the Naga Hills* (London, 1896).

MANIPUR, or Imphal. The capital of the native State of Manipur (q.v.), on the Namkathay River, 236 miles northwest of Mandalay (Map: Burma, B 2). The town is encircled by a wall and is the centre of a populous district. An export trade is carried on in cattle, tea, and rice. Here in 1891 occurred the massacre of British officials, which led to a change of administration and the establishment of a military cantonment. Pop., 1901, 67,093; 1911, 74,650.

MA'NIS (Neo-Lat., assumed sing. of Lat. *manes*, ghosts; so called from the animal's nocturnal habits). The ordinary and generic name of the scaled anteaters or pangolins of the Old World edentate family Manidæ. Seven species are recognized, all inhabiting the tropical parts of Asia or of Africa. In general structure and habits they resemble the American anteaters (see Anteater), but are singular in having the body covered with horny imbricated scales, between which (except in the adults of the African

LONG-TAILED MANIS OR PANGOLIN.

forms) grow hairs; these scales are sharp-edged and are large upon the trunk and long terete tail, but small on the head, neck, and limbs. A common name is scaly anteater. Their legs are short and strong, and their feet armed with powerful claws, with which they burrow, and in walking those of the forefeet are turned under. They feed, always at night, exclusively on ants and termites, which they procure by means of their long viscid tongue. All are able to roll themselves into a ball, which a man's strength is unable to open, and thus they present to their enemies only an armored surface, after the manner of armadillos. The largest species are those of Africa, and live upon the West Coast, one (*Manis gigantea*) reaching a length of 6 feet, including the tail. The one called phatagen by the ancients was probably the long-tailed manis (*Manis macrura*). A third, the short-tailed (*Manis temminckii*), ranges all across south Central Africa. The three Asiatic species are little different. One, common in India (*Manis pentadactyla*), has a body 2½ feet long and dwells in rocky places. A second species ranges eastward to China, and a third, more slender and long-tailed (*Manis javanicus*), is the one originally called by the Malays pangolin, a term often now applied to the whole genus. They do not live well in captivity and show but little signs of intelligence. Consult writers on the zoölogy of India and Africa; also W. T. Hornaday, *Two Years in the Jungle* (New York, 1885); F. E. Beddard, *Mammalia* (London, 1902); C. W. Beebe, in *New York Zoölogical Society, Bulletin*, vol. xvii (New York, 1914).

MANIS'SA, or Manisa (the ancient Magnesia ad Sipylum: see Magnesia, 1). A town of Asia Minor, in the Vilayet of Aidin, 40 miles northeast of Smyrna, with rail connection (Map: Turkey in Asia, A 2). It has numerous mosques, one Armenian and several Greek churches, four

synagogues, and several notable secular buildings, among them the palace of Kara Osman Oglu. The chief industries are the manufacture of cotton goods and pack saddles. Pop., about 35,000, including 13,000 Greeks, 6000 Armenians, and 3000 Jews. For history and archæology, see MAGNESIA, 1. Consult Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., Leipzig, 1914).

MANISTEE, măn'ĭs-tē'. A city and the county seat of Manistee Co., Mich., 114 miles by rail northwest of Grand Rapids, on the Manistee River, which flows between Manistee Lake and Lake Michigan, a distance of 1 mile, and on the Pere Marquette, the Manistee and Northeastern, and the Michigan East and West railroads (Map: Michigan, C 4). It has a fine harbor and regular steamship communication, during the open season, with Chicago, Milwaukee, and other points on the lake. The city is in a fertile fruit-growing region, and its excellent transportation facilities have developed large commercial interests, particularly in lumber and salt, which are manufactured on an extensive scale. There are manufactures also of furniture, foundry products, vacuum pans, and sole leather. The principal features of interest are a fine courthouse, Carnegie library, Mercy Hospital, Home for Aged Women, Federal building, two bridges across the Manistee River, and Orchard Beach, a popular lake resort. Settled about 1849, Manistee was chartered as a city in 1869 and adopted the commission form of government in 1914. The city owns and operates the water works. Pop., 1900, 14,260; 1910, 12,381.

MANISTIQUE, măn'ĭs-tēk'. A city and the county seat of Schoolcraft Co., Mich., 107 miles by rail west by south of Sault Ste. Marie; on Lake Michigan, at the mouth of the Manistique River, and on the Minneapolis, St. Paul, and Sault Ste. Marie, the Ann Arbor, and the Manistique and Lake Superior railroads (Map: Michigan, C 3). It has some reputation as a summer resort, but is known chiefly as an industrial and commercial centre, its trade being carried on both by rail and lake. There are limekilns, ironworks, and manufactories of lumber, chemicals, alcohol, cedar products, and charcoal. The fishing interests also are important. There are municipally owned water works and a public library. Manistique received a city charter in 1901. Pop., 1900, 4126; 1910, 4722.

MANITO. See MANITOU.

MANITOBA, măn'ĭ-tō'bȧ. A province of the Dominion of Canada, extending from the international boundary line to Hudson Bay, situated between 49° and 60° N. lat. and between 92° and 101° 20′ W. long. (Map: Canada, L 5, 6). It is bounded on the north by the Northwest Territories, on the east by Ontario, on the south by the States of Minnesota and North Dakota, and on the west by Saskatchewan. Area, 251,832 square miles, including 19,906 square miles of water.

Topography. The province belongs to the great central prairie region in the south and west, and in the east and north it is a part of the Laurentian country, broken and hilly, with a higher altitude than the adjoining region. The southeastern part consists of an almost perfectly level lacustrine bed, the bottom of the Pleistocene Lake Agassiz. (See LAKE AGASSIZ.) It slopes very gently northward, being 800 feet above the sea in the south and 710 feet in the north. Its western boundary is formed by a line of escarpments with a maximum height of 500 feet above the plain and running southeast to northwest. These are the ancient shore lines of Lake Agassiz, and above them stretches a more elevated and undulating plain known as the Riding and Duck Mountains, which cover the western and southwestern parts of the province. Both this plain and the lacustrine plain below are treeless prairies, becoming gradually wooded northward, first along the river courses and in isolated clumps of poplars, and finally thickening into dense pine forests on the Duck Mountain in the northwest. The principal river is the Red River of the North, which enters the province from the south and flows through the prairies into Lake Winnipeg in the southern part of the province. Its chief tributary is the Assiniboine, cutting through the western upland. Nearly all the rivers of the province have cut their beds through the soft drift deposits, so that they flow in narrow valleys from 30 to nearly 100 feet below the surrounding plains. As the waters of Lake Agassiz were drained off the lowest depressions of its bed remained flooded and now form the great lakes of the province. Of these Lake Winnipeg is 270 miles long and from 20 to 60 miles broad, Lake Winnipegosis 150, and Lake Manitoba 135 miles long. The last named is very shallow, and the shores of all are low and marshy.

Climate. The climate is very cold in winter and warm in summer. The mean annual temperature is 33° F., and the extremes 95° F. and 40° or even 50° below zero F. Both extremes, however, are rendered bearable by the dryness of the air; and the winter cold does not interfere with the wheat crops, as the sowing season arrives here even earlier than in the eastern provinces which lie farther south. The mean annual rainfall is only 17.43 inches, but 74 per cent of it falls in growing seasons, the winters being dry and sunny and the snowfall light.

Geology and Minerals. The Laurentian system of ancient crystalline rocks extends into the northern and eastern part of the province, from the east shore of Lake Winnipeg nearly to Hudson Bay. It is bordered by a belt from 60 to 120 miles wide of Silurian and Devonian limestones running from southeast to northwest through the east-central part of the province and forming the western shore of Lake Winnipeg. The remainder of the plains consists of Cretaceous and Laramie formations. Nearly the whole surface, however, is covered with a thick deposit of glacial drift. The principal minerals are lignite and coal, which are mined to some extent along the Souris River, near the southern boundary. By a recent law the settlers are allowed to mine for home use the outcropping coal on public lands by paying a small royalty to the government. Some deposits of iron are also found, but are not worked. Extensive deposits of gypsum have been found in the Dauphin District, north of Lake St. Martin. Gold is found near the east boundary, in the Lake of the Woods area. Brine springs exist on the peninsulas in the southern part of Lake Winnipegosis, but no salt has been manufactured.

Soil and Productions. The poor soils characteristic of the Laurentian region prevail in the eastern part of the province, and in the hills to the west the soils are also of a poor quality. Over the greater portion of the western plains the soil consists of a very deep mold or loam with a tenacious clay subsoil. The best quality

MANITOBA
SCALE OF MILES
0 10 20 30 40 50
Railways thus:
Longitude 99 West from 98 Greenwich
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is found in the Red River valley, which was formerly the bed of Lake Agassiz, and the soil of which is therefore a lake deposit. The Red River valley has become famous for its enormous production of the finest qualities of wheat. The region farther to the west also produces abundantly and contains vast fields of wheat.

Agriculture. The main economic interests of the province centre in agriculture. The hardier grain and root crops are grown with great success, but the season is too short for corn. In extent of area the annual crop of wheat is greatly exceeded by many American States, but the grade of wheat is unexcelled. Oats are also extensively grown, and barley, potatoes, and flax are important crops. The increase and variation of acreage of the leading crops are shown in the following table.

	1913	1911	1901
Wheat	2,804,000	3,094,833	1,965,200
Oats	1,798,000	1,307,434	573,858
Barley	496,000	448,105	139,672
Forage crops	177,000	166,615	43,667
Flax	54,000	79,765	14,404
Potatoes	26,000	26,488	16,042

The decline in wheat acreage in 1913 is due in part to the growth of mixed farming and stock raising. The grasses, both natural and cultivated, grow luxuriantly and afford excellent pasturage. The variation in the number of domestic animals is shown in the following table, taken from official returns.

	1913	1911	1901
Horses	304,088	280,374	163,867
Milch cows	152,792	155,337	141,481
Other cattle	256,926	279,776	208,405
Sheep	42,840	37,322	29,464
Swine	184,745	188,416	126,459

The figures in the above tables for 1901 and 1911 are taken from the census for those years respectively, and those for 1913 are the estimates of the Census and Statistics Office, Ottawa.

The value of the butter and cheese product in 1910 was $593,375. In 1910 there were produced 694,712 pounds of cheese, valued at $81,403. In 1910 the butter production was 2,050,487 pounds, valued at $511,972.

Game and Fisheries. Large numbers of game and fur-bearing animals continue to abound in the north (a region now known as New Manitoba) and are profitably hunted. They include the deer, antelope, elk or wapiti, moose, reindeer or caribou, marten, mink, fisher, and muskrat. Duck, grouse, quail, woodcock, and plover are found in great numbers. Of greater importance are the resources of fish in the large lakes. Large quantities of whitefish, pickerel, sturgeon, and other varieties are caught annually. Assistance from the Dominion government is given for the development of markets for fresh fish in the interior of the provinces by payment of one-third of the ordinary express charges from the Atlantic coast on shipments of fresh fish as far west as the east boundary of Manitoba and from the Pacific coast as far east as that boundary. Manitoba has four of the 51 fish hatcheries supplied by the Dominion government. The value of the Manitoba catch in 1913 was $800,149.

Transportation, Manufactures, Banks. The Dominion, provincial, and municipal governments have aided in the construction of railroads and an admirable system has been developed in the southern portion of the province and is being extended northward. The Canadian Pacific, Grand Trunk Pacific, and Canadian Northern pass through it and establish communication with both the Atlantic and Pacific oceans. Branch lines of the Northern Pacific Railroad pass up the Red River valley and establish connection with the railroad systems of the United States. The National Transcontinental enters Manitoba on the east boundary and runs to Winnipeg. A railway line was under construction by the Dominion government in 1914 from Le Pas in Manitoba to Hudson Bay. There were, in 1913, 3993 miles of steam railway in operation in Manitoba and 872 miles in course of construction. The large lakes to the north, together with the Saskatchewan River system, afford possibilities for an extensive development of water communication with the region to the north and west—possibilities which have only just begun to be realized. The Red River to the south and the Assiniboine to the west are also navigable during the high-water season, but have been little used since the construction of railroads. Enormous quantities of wheat are annually exported to English markets, and exports of hard wheat to the United States for milling purposes and for mixing with the softer varieties of wheat show a substantial increase.

The manufacturing industries, which in 1900 were chiefly represented by flour and lumber mills, had increased in 1905 to 354 establishments, with $27,517,297 invested capital, employing 10,333 hands, with salaries and wages of $5,090,791 and an output valued at $28,155,732; in 1910 there were 439 establishments, an invested capital of $47,941,540, employing 17,325 hands, paying $10,912,866 in wages and salaries, and with an output valued at $53,673,609. Winnipeg in 1910 was the fourth manufacturing city in Canada.

In 1914 the bank branches located in Manitoba numbered 205. In 1913 the clearing-house transactions at Winnipeg amounted to $1,634,977,237, making this place third among Canadian commercial centres in the importance of its clearing-house transactions.

Population. The population of Manitoba has been acquired almost wholly since 1870. In that year there were only 2000 whites in the province and an Indian half-breed population of about 10,000. In 1881 the population had increased to 62,260, in 1891 to 152,506, in 1901 to 255,211, and in 1911 to 455,614. In 1911, of the total population of 455,614 those born in Canada numbered 264,828 and those born in the British Isles and possessions, 91,606; the foreign born numbered 95,688, of whom 78,051 were born in continental Europe and 16,326 in the United States. There were 10,822 Indians in 1913. Winnipeg had in 1911 a population of 136,035; Brandon, 13,839; Portage la Prairie, 5892; and St. Boniface, 7483.

Government. The government of Manitoba consists of a lieutenant governor, appointed by the Governor General in Council of Canada, an executive council of seven members, responsible to the provincial Legislature, and the Legislative Assembly of 41 elective members. The seat of government is Winnipeg. Up to 1890 French

was the official language used by the Legislature. The common law of England is in force in the province. Manitoba sends four Senators and 10 members of the House of Commons to the Dominion Parliament. Practically universal manhood suffrage exists, and the time requirement is one year in the province and three in the electoral division. The judicial system consists of the Court of Appeal, with a chief justice, who ranks as chief justice of Manitoba, and four minor judges; the Court of King's Bench, with a chief justice and five minor judges; and also surrogate courts, county courts, police magistrates, and justices of the peace. The rural regions are organized into townships, and the denser units of population are organized into villages, towns, or cities, according to number of inhabitants. In each of these the governmental affairs are intrusted to a council (called board of aldermen in cities), as is true also of the counties, the members of the county council being elected by the townships and villages.

The receipts and expenditures show a gradual increase from less than $900,000 each in 1880 to $5,788,070 and $5,314,849 respectively for the year ended Nov. 30, 1913. The principal items of revenue were as follows: the Dominion subsidy, $1,349,895; provincial telegraph and telephones, $1,814,407; sales of provincial lands, $323,769; land titles, general fees, $328,137; liquor licenses, $162,466; succession duties, $268,009; railway tax, $205,358; interest on school land funds, $237,488. The principal items of expenditure were: public works, $1,322,963; education, $668,832; Treasury Department, $798,-837; Department of Agriculture and Immigration, $411,781; Attorney-General's Department, $563,491. The Dominion subsidy, which forms a large part of the receipts, was increased by reason of the extension of Manitoba's boundaries in 1912. On Nov. 30, 1912, there were 1296 prisoners and insane persons in provincial institutions. Of charitable institutions the province maintains in whole or in part 11 general hospitals, two orphanages, a home for incurables, a deaf and dumb institution, a woman's home, and a Salvation Army rescue home. One of the five Dominion penitentiaries is located in the province.

Public Utilities Commission. An important measure was enacted in 1912 establishing the control of a commission, consisting of a commissioner and his secretary, over all the public utilities subject to the legislative authority of the province (including telegraph and telephone lines, companies furnishing water, gas, heat, light, or power either directly or indirectly to the public), the provincial government telephones and the business carried on under the Manitoba Grain Elevators Act, and also such municipalities as shall properly consent to come within the authority of the commission. The latter has the powers of a court of record, can enforce its judgments, value the property of public-service corporations, regulate rates, control issues of stocks and bonds, and compel a uniform system of accounting. The judgments of the commission are final, except as to questions of jurisdiction, from which an appeal can be taken. Municipal franchises are subject to the commission's approval. The work of the commission was watched with much interest because of its importance as an economic and political experiment. The report for 1913 showed the commission at work shaping the measures resulting in obtaining a Winnipeg water supply and procuring the consent of two cities, four towns, and certain rural municipalities, all of which were to share in the benefits. Other work done included investigations and reports upon publicly owned property and awards and decisions affecting disputes between municipalities and railway companies. Public approval of certain measures was secured by vote in various municipalities and, wherever necessary or expedient, popular opinion is sought in order to strengthen the efforts of the commission. Public confidence therein has thus far resulted from the judicial power and responsibility, subject to provincial legislation, with which the commission is invested, and which enable it to procure adequate evidence and the aid of experts.

Religion. The Roman Catholic church was first in the field, missions having been established among the Indians at a very early day. Among the more recent colonists, however, the Protestants have greatly preponderated, Roman Catholics in 1911 numbering 73,994, less than one-sixth of the total population. A Roman Catholic archbishop resides at St. Boniface, and the see house of the Anglican Bishop of Rupert's Land is at Winnipeg. Of the Protestants in 1911 the Presbyterians (103,621), Anglicans (Episcopalians) (86,578), Methodists (65,897), Baptists (13,992), Lutherans (32,730), and Mennonites (15,600) were the most important. There were 31,042 adherents of the Greek church in 1911.

Education. Originally the school system of Manitoba recognized a complete separation of Roman Catholics and Protestants, but in 1890 the schools were made undenominational; the Act making this provision was unsatisfactory to the Roman Catholics, and was amended in 1897 so as to admit of religious instruction when demanded by the parents of a certain number of pupils, but which would not be obligatory upon the other pupils, nor lead to the establishment of separate schools. According to the report of the Minister of Education for the year ended June 30, 1913, the school population numbered 99,750, of whom 83,679 were enrolled in the public schools and 48,163 were in average attendance. In the same year there were 2964 teachers and 2430 schools. Of the teachers 500 were male and 2464 were female. The value of school property was $8,780,076. There were 13 high schools, 16 collegiate institutes, and a normal school. The provincial university elected its first president, Dr. James A. MacLean, in 1913, and in 1914–15 had made rapid progress towards establishing a teaching faculty and accomplishing an extensive building programme. Formerly the university was only an examining and degree-conferring body. Several theological and other colleges are affiliated with it.

History. Sieur de la Verandrye (q.v.), a French Canadian explorer, twice visited the territory now included in Manitoba, building Fort de la Reine, on the site of Portage la Prairie, in 1733, and five years later Fort Rouge, on the site of Winnipeg. The fall of Quebec in 1759 opened to British fur traders and merchants a vast tract previously held by the French and stimulated fur trading in the vast regions controlled by the Hudson's Bay Company. The Northwest Company, founded in Montreal in 1795, became a powerful rival of the latter. A

race of half-breeds, sprung chiefly from the marriages of French and Scotch employees of the two companies with Indian women, began to settle along the banks of the Red and Assiniboine rivers, acquiring squatters' rights, which they afterward resolutely defended. In 1811 the Earl of Selkirk, a member of the Hudson's Bay Company, attracted by the fertility of the soil on the banks of the Red River, obtained from the company a grant of a large tract of land on both banks of the river, extending some distance within the present frontier of the United States. The following year he brought out a number of settlers from the Highlands of Scotland. The right of the Hudson's Bay Company to grant this land was, however, disputed by the Northwest Company, and when the settlers began to build they were driven off by the servants of the Northwest Company. Hostilities continued between the servants of the two companies for several years, and in 1816 there was a pitched battle between them. The Earl of Selkirk, arriving soon after, found his settlers scattered; but by his energetic measures, and by help of 100 disbanded soldiers from Europe whom he had brought with him, he secured for his old and new protégés a peaceful settlement. They established themselves near Fort Garry (now Winnipeg), and in 1817 the Earl obtained from the Indians a transfer of their right to the land 2 miles back from the Red River on both sides. Still the settlers had some difficulties to overcome, especially from visitations of grasshoppers. These were gradually surmounted; but the population, including now a large number of half-breeds, remained very isolated, having little communication with the outside world. The Northwest Company was amalgamated in 1821 with the Hudson's Bay Company. Between 1841 and 1867 the acquisition and organization of the vast territories exploited by the fur companies had been much discussed by statesmen of the old Province of Canada, but no decisive action was taken until 1869, two years after Confederation.

In that year the Hudson's Bay Company surrendered all their claims to the Northwest Territories to the British government, which in the following year transferred that region to Canada. While the proposed transfer to the British crown of the Hudson's Bay Company was pending this portion of their dominions was the scene of considerable contention and violence. The French-speaking population, led by Louis Riel (q.v.), a half-breed, organized a force, imprisoned their English and Scotch opponents, seized Fort Garry, established a provisional government, robbed the strong box, and dictated terms to the governor of the Hudson's Bay Company, to which he had to submit. A military force under Colonel Garnet (later Field Marshal Viscount) Wolseley arrived in the province in July, 1870, and Riel, fearing capture, fled, upon which the insurrection collapsed. In 1870 that portion of the Red River district between long. 96° and 99° W. and lat. 49° and 50° 30′ N. was organized as the Province of Manitoba, and its admission to the Confederation took place in July of the same year. Discontent among the Indians was allayed by several treaties (1871–77) under which reservations were allotted to them, with the option of living therein after the manner of the white population or of retaining their native customs. Canadian and American commissioners worked together to define the international boundary between the United States and Manitoba (1872). In 1873 the Royal Northwest Mounted Police was organized (see MILITARY POLICE), and two years later amnesty was granted to those who took part in the rebellion of 1869, excepting Riel and two of his confederates. Although the rights of the Indians were thus early safeguarded, the half-breeds were neglected, with the result that in 1885 there was another rebellion (see SASKATCHEWAN), likewise headed by Riel. The rebellion was suppressed the same year and Riel was captured and hanged. Manitoba became involved in the boundary dispute between the Dominion and Ontario. Sir John A. Macdonald, unfavorable to Ontario's assertion of provincial rights, procured in 1881 the passage of a bill extending the boundaries of Manitoba towards the west, which would have taken from Ontario part of the territory awarded to that province in 1878. Ontario vigorously opposed this threatened loss, proceeded in 1883 to assume full ownership and control of the disputed area, and was thus brought into political conflict with Manitoba. Besides the effort to enlarge her boundaries, Manitoba also contended for larger grants from the Dominion Treasury and freedom from the monopolistic construction privileges of the Canadian Pacific Railway. These privileges were abolished in 1888. The boundary claims of the province were rejected by a decision of the Judicial Committee of the Privy Council in 1884, but the dispute continued until 1912, when it was finally settled by the addition of 178,100 square miles to the old provincial area. The Dominion subsidies to Canada were also increased. In 1890 the question of parochial or separate schools went far to make Manitoba the storm centre of federal as well as provincial politics. In 1871 the province had established a system of separate schools under which Roman Catholic pupils were controlled by the Roman Catholic section of a general school board. Thomas Greenway (q.v.), the provincial Premier, procured the enactment of laws abolishing separate schools and the official use of the French language in the province. This was strongly resented by the Roman Catholic and French-speaking population, and a struggle ensued for the repeal of the obnoxious legislation. The French of Quebec and Roman Catholics throughout the Dominion sympathized with the minority in Manitoba. The case was taken eventually to the highest court of colonial appeal, the Judicial Committee of the Privy Council, whose decision referred to the Dominion government the duty and task of enforcing a remedial measure against Manitoba, according to the provisions of the British North America Act. The question thus became a federal issue and excited prolonged and bitter controversy. The Conservatives favored the forcing of Manitoba to change the new school law; the Liberals advocated a milder course. Upon the advent of Wilfrid Laurier to the Dominion premiership in 1896, his administration, together with the Manitoba administration of Thomas Greenway, arranged a compromise whereby, without the full restoration of separate schools, religious instruction was to be given after regular school hours to the children of either Protestant or Roman Catholic parents. This arrangement was agreeable to the party of provincial rights, but it did not placate the Roman Catholic population.

After 1896 a large increase in immigration and agricultural production gave rise to new economic and political problems. The Liberal and Conservative parties respectively in the province were in large part affiliated with the corresponding parties in Dominion politics; but both showed a greater readiness to increase government initiative in the ownership and supervision of public services, though the leading part therein was taken by the Conservatives. Prohibition of the liquor traffic became a party question, the Liberals generally advocating abolition of the bar and the Conservatives local option. In 1905 the Conservative administration of Sir R. P. Roblin (q.v.), who had become Premier in 1900, passed a high-license bill; but the movement for abolition of the bar was vigorously continued. Premier Roblin sought to conciliate the Prohibitionists by a measure for the earlier closing of saloons (1914). Reorganization of the Court of King's Bench, the creation of a Court of Appeal, and the compulsory display of the British flag on public schoolhouses had been effected by 1907. Railway extension to districts with few or no transportation facilities was also aided liberally, and in 1908 an important step in the ownership and regulation of public utilities was taken in the government's purchase and operation of the Bell telephone system. A workmen's compensation act was passed in 1910. An elaborate system of elevators for the storage of grain and the facilitation of shipments thereof under the Canada Grain Act (1912) had been organized in Ontario, the Northwest Provinces, and British Columbia; and Manitoba participated importantly therein on account of Winnipeg being one of the centres for grain inspection, the others being the great terminal elevators at Port Arthur and Fort William, Ontario. Consolidation and regulation of public utilities became the subject of notable legislation in 1912. See section on *Public Utilities Commission.*

The question of religious education in 1912–14 became more urgent on account of the increasing variety of immigration. The lingual provisions of the school compromise of 1897, and the giving of religious instruction after school hours, became more difficult because of the demands of German, Scandinavian, and Slav elements of the population. The law implied that teachers of children speaking other than English must qualify to teach them in their mother tongue as well as in English. The Liberals favored compulsory education and the strict enforcing of the teaching of English; the Conservative government, a liberal construction of the law. It was recognized that the question contained elements of future disturbance. The War in Europe (q.v.) aroused demonstrations of loyalty throughout the province; nevertheless, in certain German newspapers contrary sentiments and opinions were expressed until prohibited by the government. The Royal Northwest Mounted Police, part of which force is employed in the more unsettled parts of Manitoba, was increased by 500 men in order to deal more effectively with disturbing conditions due to the war.

The lieutenant governors of Manitoba since its incorporation into the Dominion in 1870 are: A. G. Archibald, 1870–72; Francis G. Johnston, 1872; Alexander Morris, 1872–76; Joseph E. Cauchon, 1876–82; J. C. Aikins, 1882–88; Sir John Schultz, 1888–95; J. C. Patterson, 1895–1900; Sir D. H. McMillan, 1900–11; Sir D. C. Cameron, 1911– .

The different premiers of provincial administrations since 1870 are: Alfred Boyd, 1870–71; Marc A. Girard, 1871–72; H. J. H. Clarke, 1872–74; Marc A. Girard, 1874; R. A. Davis, 1874–78; D. H. Harrison, 1878–88; Thomas Greenway, 1888–1900; Hugh J. (afterward Sir) Macdonald, 1900; R. P. (afterward Sir) Roblin, 1900– .

During the earlier years of provincial administration party lines were not very strictly drawn; but with the Liberal administration of Thomas Greenway and the Conservative administrations of H. J. Macdonald and R. P. Roblin Manitoba had developed a regular party system.

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MANITOBA, Lake. A body of water in the Province of Manitoba, Canada, intersected by the fifty-first parallel and the ninety-ninth meridian (Map: Manitoba, E 3). It is about 60 miles southwest of Lake Winnipeg, which receives its waters through the Saskatchewan, or Dauphin, River, which, near the middle of its course, expands into St. Martin's Lake. Manitoba Lake is about 125 miles long and about 25 miles wide; area, about 1900 square miles. It is 40 feet higher than Lake Winnipeg, and navigable for vessels drawing 10 feet of water. It abounds in fish, and its shores are resorted to by sportsmen for moose, elk, deer, and wild fowl. At its north end it receives the waters of several smaller lakes, and at the south those of the White Mud River. The scattered settlements around are inhabited chiefly by Norwegians and Icelanders.

MANITOU, măn′ĭ-tōō. A town in El Paso Co., Colo., 6 miles northwest of Colorado Springs, on the Colorado Midland and the Denver and Rio Grande railroads (Map: Colorado, E 3). The centre of a region renowned for picturesque scenery, Manitou is situated about 6300 feet above the sea, at the junction of and in three cañons—Ute Pass, William's Cañon, and Engleman's Cañon—at the foot of Pikes Peak (q.v.). A number of important mineral springs, which are valued for their medicinal properties, and the many natural attractions of the vicinity, combine in making Manitou one of the most popular health and pleasure resorts in the United States. The varied features of interest are the Pikes Peak Cog Railway, which begins here, the

Cave of the Winds, cañons, falls, drives, Soda Spring Park, and the famous Garden of the Gods (q.v.), which contains picturesque formations of red and white sandstone. The town contains a Carnegie library and a tuberculosis sanitarium. Spring water is bottled and shipped in large quantities. The population in summer is estimated at between 10,000 and 15,000. Pop., 1900, 1303; 1910, 1357.

MANITOU, or **MANITO** (Algonquian Indian, mystery, supernatural). An Algonquin word now used in current writing to designate a special religious concept common to the Algonquin-speaking Indian tribes of the Great Lake region. These Indians believe in the existence of a cosmic mysterious property pervading the universe and manifest everywhere. In their sacred mythology this element is personified in various manlike gods spoken of as the manitous, but the Algonquin never ceases to feel that the real manitou property may and does reside in any and all things. It is fairly evident that there is not and never was in primitive Indian beliefs any conception corresponding to the modern civilized idea of God or Deity. The manitou might be a supernatural being of any grade however low, and, further, anything mysterious or beyond comprehension was manitou. Another term of Chinook origin, viz., tamanuus, is now widely used in the Northwest of North America to express much the same conception, and the cult of the tamanuus as a protecting spirit of an individual has thrown much light on shamanistic customs and beliefs. A similar conception is termed wakanda by the Sioux and orenda by the Iroquois. In Melanesia there is the strikingly similar notion of "mana." Mana is believed to effect anything outside the ordinary course of nature; thus, a strangely shaped stone is interpreted as containing mana, and any conspicuous success achieved by a person is ascribed to his possession of mana. The occurrence of this conception in two quite distinct culture areas has led a number of writers to ascribe to it an important place in the development of religious beliefs. It has been assumed by some that the Algonquian manitou is an essence or force, but Radin's most recent data indicate that this is an abstraction created by the investigators: "If a belief in a manito 'essence' or 'force' exists, it is as a characteristic of a manito" (being). This again strengthens the resemblance with mana, for, while impersonal, mana is always connected with some directing personal agency (Codrington). Consult: R. H. Codrington, *The Melanesians* (Oxford, 1891); Jones, "The Algonkin Manitou," in *Journal of American Folk-Lore* (Boston, 1905); F. W. Hodge (ed.), *Handbook of American Indians North of Mexico* (Washington, 1907–10); Saintyves, *La force magique* (Paris, 1914); Paul Radin, "An Introductive Enquiry into the Study of Ojibwa Religion," in *Ontario Historical Society, Papers and Records*, vol. xii (Toronto, 1914). See INDIANS, AMERICAN; TOTEMISM.

MANITOULIN (măn′ĭ-tōō′lĭn) **ISLANDS.** A group situated in Lake Huron, from whose north shore it is separated by North Channel, varying from 7 to 18 miles in breadth (Map: Ontario, B 2). It comprises Great Manitoulin, or Sacred Isle; Little Manitoulin, or Cockburn Isle, belonging to Great Britain; and Drummond Isle, belonging to the State of Michigan. Great Manitoulin is 90 miles long by 5 to 30 broad; Little Manitoulin is circular in shape and has a diameter of 7 miles; Drummond Isle is 24 miles long by from 2 to 12 broad. All are irregular and striking in their natural features; the first two are covered with large and dense forests of pine. The islands afford good fishing and the various villages on them are favorite summer resorts. Half of the resident population are Ojibwa Indians. Pop., 2000.

MANITOWOC, măn′ĭ-tō-wŏk′. A city and the county seat of Manitowoc Co., Wis., 75 miles north of Milwaukee, on Lake Michigan, at the mouth of the Manitowoc River, and on the Chicago and Northwestern, the Ann Arbor, the Minneapolis, St. Paul, and Sault Ste. Marie, and the Pere Marquette railroads (Map: Wisconsin, F 4). It has a fine harbor with good docking facilities and considerable lake commerce, the shipments being principally grain, flour, cheese, coal, etc. The city is chiefly interested in the building of ships; other industrial establishments include aluminium-ware factories, cigar factories, extensive malt houses, grain elevators, coal docks, planing mills, brick yards, furniture and canning factories, machine shops, and edge-tool and agricultural-implement works. The County Insane Asylum, the Holy Family Hospital, and a Polish orphan asylum are situated here. Other noteworthy features are the Training School for Teachers, public library, and three beautiful parks. Manitowoc was chartered as a city in 1870. The water works and electric-light plant are owned by the city. Pop., 1900, 11,786; 1910, 13,027; 1914, 13,553; 1920, 17,563.

MANIZALES, mä′nĕ-sä′lās. A town of Colombia, the capital of the Department of Caldas. It is situated 100 miles northwest of Bogotá, and at the junction of the main routes over the Central Cordillera, 6400 feet above sea level (Map: Colombia, B 2). It was founded in 1848 and has had a very rapid growth. The town is a thriving commercial centre and is of great strategic importance. It has gold-mining and stock-breeding industries, a bank, and a public library. Pop., 1905, 24,676; 1912, 34,720. The town was the headquarters of the rebels during the civil war of 1877–78.

MANKATO, măn-kā′tō. A city and the county seat of Blue Earth Co., Minn., 86 miles southwest of St. Paul, at the confluence of the Minnesota and Blue Earth rivers and on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Chicago Great Western railroads (Map: Minnesota, D 6). It has a State normal school, a fine Federal building, Carnegie library, a ladies' seminary (Lutheran), a Catholic mother house, two commercial colleges, and Immanuel and St. Joseph's hospitals. Other places of interest are the spot where 38 Indians, convicted of murder, were hanged during the Sioux Indian outbreak in 1862; Minneopa State Park, which has picturesque falls; and Rapidan Dam. The city is in an agricultural region and has extensive quarries of stone. Excellent water power is afforded the industrial establishments, which include flour and knitting mills, foundries and machine shops, lime, brick, and cement works, woodworking plants, and manufactories of shirts, overalls, traction engines, cigars, candies, incubators, steam engines, tents, awnings, brooms, etc. Mankato adopted the commission form of government in 1910. The water works are owned by the city. Pop., 1900, 10,599; 1910, 10,365; 1920, 12,469.

MAN′LEY, or **MANLY**, JOHN (1733–93).

An American naval officer, born at Torquay in England. He removed to Marblehead, Mass., and at the outbreak of the Revolution joined the naval forces of the Colonies. Washington appointed him commander of the Massachusetts State cruiser *Lee*, in which capacity he rendered efficient service during the siege of Boston by intercepting British supplies. In 1776 he received from Congress a commission as captain of the new cruiser *Hancock*, and soon after putting to sea captured the British man-of-war *Fox*. The following year, while cruising in company with the *Boston*, he fell in with the two British men-of-war *Rainbow* and *Victor*, and, being deserted by his consort, was captured. In 1782 he was put in command of two privateers and the government frigate *Hague*, in which he was attacked by a superior British force, but managed to make his escape.

MANLEY, Mary de la Rivière (c.1663–1724). An English author, daughter of Sir Roger Manley, Governor of the Channel Islands, born in Jersey, or at sea between Jersey and Guernsey. Having been beguiled (about 1688) into a mock marriage with her cousin, John Manley of Truro, she lived for a time with the Duchess of Cleveland. Besides plays and short novels, she wrote many numbers of the *Examiner*, after Swift abandoned it. For some years she was the mistress of Alderman Barber. She died at Barber's printing house on Lambeth Hill, July 11, 1724. Mrs. Manley employed her talents mainly in depicting the scandalous life of the times. *Letters Written by Mrs. Manley* (1696) and the *Secret History of Queen Zarah and the Zarazians* (1705) were followed by the *New Atalantis*, of which two volumes appeared in 1709. With this famous work were afterward incorporated *Memoirs of Europe* (1710) and a further continuation. Among several plays which she wrote may be mentioned *Lucius*, played at Drury Lane (1717). In 1720 appeared a series of short tales called *The Power of Love, in Seven Novels*. Incidents in her own career Mrs. Manley related in the *Adventures of Rivella* (1714).

MAN'LIUS. A Roman gens, chiefly patrician, some of whose members played an important part in the history of the Republic. 1. Marcus Manlius Capitolinus, who was consul in 392 B.C. and two years later gained his surname by rescuing the Capitol from the attacks of the Gauls, after he was roused by the cackling of the sacred geese. Later, tradition says, he favored the lower classes, and, in consequence, in 381 was arraigned before the Comitia Centuriata on a charge of aspiring to be king, and sentenced to be thrown from the Tarpeian Rock. The name of Marcus was never after borne by any of the Manlian gens, who considered him a traitor to his family and class. 2. Lucius Manlius Imperiosus, dictator 363 B.C. 3. Titus Manlius Imperiosus Torquatus, son of Lucius, military tribune, twice dictator (353, 349 B.C.), and three times consul. His surname was derived from his having despoiled a gigantic Gaul of a golden chain (*torques*) after having slain him in single combat. In his last consulship he waged a successful war against the Latins and Campanians, defeating them in two battles near Vesuvius; in one his colleague, P. Decius Mus, devoted himself. Manlius, too, caused to be put to death his own son, who had disobeyed his orders by engaging in single combat with the enemy. 4. Titus Manlius Torquatus was consul in 235 and in 224 B.C., censor in 231, dictator in 208. In 235 he subdued Sardinia, which had been ceded to Rome by Carthage at the close of the First Punic War. In 224 he defeated the Gauls and crossed the Po. In 216 he was victorious over the Carthaginians when they tried to regain Sardinia. 5. Gneius Manlius Vulso, consul 189 B.C. He was victorious over the Galatians in Asia Minor.

MANLY, John. See Manley, John.

MAN'LY, John Matthews (1865–). An American scholar, born in Sumpter Co., Ala., and educated at Furman University and at Harvard, where he took the degree of Ph.D. in 1890. During the preceding six years he had been a teacher as well as a student; and after leaving Harvard he was successively associate professor and professor of English at Brown University (1891–98), and professor of and head of the department of English in the University of Chicago. In 1909 he was the Chicago exchange professor at the University of Göttingen. A contributor to the *Cambridge History of English Literature* and the *Encyclopædia Britannica*, he was also the editor of *Specimens of the Pre-Shakespearean Drama* (1897); *English Poetry* (1907); *English Prose* (1909). He also served as managing editor of *Modern Philology*.

MAN MILLINER, The. A nickname given to Henry III of France on account of his effeminacy and fondness for dress.

MANN, Sir Donald D. (1853–). A Canadian railway promoter. He was born at Acton, Ontario, and was educated at the public schools and privately. He studied for the ministry of the Presbyterian church, but later relinquished that aim and engaged in business as a railway contractor. He became associated with Sir William Mackenzie (q.v.) in the building of the Canadian Northern Railway, acquired a large fortune, and was made first vice president of that railway and president of, or director in, several industrial and financial corporations. He was appointed honorary lieutenant colonel of the Twentieth Regiment (1908) and was knighted in 1911.

MANN, Horace (1796–1859). An American educational reformer and philanthropist, born at Franklin, Mass., May 4, 1796. He was graduated at Brown University, 1819. Studying law, he was admitted to the bar in 1823; in 1827 he was elected to the State Legislature of Massachusetts and six years later to the State Senate, over which he was chosen to preside in 1836. From the beginning of his legislative career he became a leader in philanthropic and reform movements of various kinds. In 1837 the State Legislature, largely on the advice of Mr. Mann, appointed a board of education to revise the school laws and to reorganize the common-school system of the State. Of this board Mr. Mann was made secretary, and for 12 years he devoted to this cause all his time, often against the most bitter opposition. This was the great work of his life, for the movement begun under his leadership was not confined to Massachusetts, but affected the entire United States and led to the development of the free public-school system as it exists to-day. These reforms were instituted through various instrumentalities, chief among which were his annual *Reports* as secretary. The 12 volumes of these *Reports* (1837–48) have become educational classics, and were reprinted in Europe as well

as circulated throughout the United States. In addition to these he also founded and edited the *Common School Journal*, through which he advocated his reform ideas. Finally, through a very great number of teachers' institutes and meetings, to which he gave indefatigable attention, he inspired the teaching body to greater efforts and with higher ideals.

In the course of his reform efforts he visited the schools of continental European countries and introduced, against a storm of opposition, many of the advanced ideas of school work, especially those growing out of the Pestalozzian movement (q.v.). The immediate work of Mann, however, which was of the greatest importance, was the reorganization of the common-school system of Massachusetts. Since the dominance of the democratic sentiment during the latter half of the eighteenth century the unit of school organization had been the district instead of the town. In place of the district, Mann sought to restore the more centralized control of the town, which would give a broader public support, a greater freedom from factional quarrels, a better financial basis, a better prepared and better remunerated staff of teachers, and better equipment. Though the reform was not accomplished until after Mann's withdrawal from the secretaryship, and in fact not finally settled until after a bitter conflict lasting a quarter of a century, yet his efforts developed the public sentiment that finally established the more centralized control of education and gave to this organization when established a far better support than education had ever received. But one service to education rendered by Horace Mann is to be rated above even all these. It was owing to his efforts that the first normal school (q.v.) in the United States for the training of teachers was established. This first school was opened in 1839 at Lexington, Mass. In 1848 Mann was elected to Congress to fill the vacancy caused by the death of John Quincy Adams. There for two terms he continued the work begun by Adams in opposition to slavery. From 1852 to 1859 Mann was president of Antioch College, Yellow Springs, Ohio, where he again led in an advanced educational movement —that of the coëducation of the sexes.

Horace Mann was not a professional educator, however, but a publicist and statesman. His greatest work was the rather indefinite one of arousing public opinion to the importance of education and the directing of legislative effort to the improvement of educational conditions. He became the leader, or at least the forerunner, of the great educational movement which has reached from the middle of the nineteenth century to the present time.

In addition to his *Reports*, his published works include: *Lectures on Education* (1840); *Lectures on Education* (1845); *On the Study of Physiology in Schools* (1850); *Slavery, Letters and Speeches* (1850); and numerous lectures and addresses.

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MANN, JAMES ROBERT (1856–). An American Congressman and lawyer, born near Bloomington, Ill. In 1876 he graduated from the University of Illinois and in 1881 from the Union College of Law at Chicago, where he thereafter practiced his profession with success. He was attorney of Hyde Park in 1888, alderman of the 32d Ward of Chicago in 1893–96, master in chancery of the Superior Court of Cook County in 1892–96, and attorney of the South Park Board in 1895. Participating in politics as a regular Republican, he was temporary chairman of the State Convention of that party in 1894 and chairman of the Cook County conventions in 1895 and 1902. He served as a member of the 55th to the 63d Congresses (1897–1915), and in 1911 was chosen floor leader of the Republican minority in the House. For one congressional term he was assisted by ex-Speaker Cannon. Mann's ability as a parliamentarian was highly praised by President Taft. In debate he led his party skillfully in its opposition to the tariff, currency, and canal tolls policies of the Democrats. He became known for his comprehensive grasp of and attention to the details of legislation and for his constant attendance at the sessions of Congress.

MANN, MATTHEW DERBYSHIRE (1845–1921). An American obstetrician, born at Utica, N. Y. He graduated at Yale in 1867 and at the College of Physicians and Surgeons, New York, in 1871. After two years' study in Heidelberg, Paris, Vienna, and London he practiced in New York until 1879, then in Hartford until 1882, and thereafter until 1910 was professor of gynecology in the University of Buffalo. He became gynecologist at the Buffalo General Hospital, and in 1894 was president of the American Gynecological Society. He was one of the physicians who attended President McKinley after he had been shot by the anarchist Czolgosz. He wrote *Immediate Treatment of Rupture of the Perineum* (1874) and *Manual of Prescription Writing* (1878; 6th ed., rev., 1907); and edited an *American System of Gynecology* (2 vols., 1887–88).

MANN, TOM (1856–). An English labor leader. He was born at Foleshill, Warwickshire, and worked on a farm for two years before he was 11 and then for three years in the mines. He became an engineer in Birmingham and (1877) in London, where in 1881 he joined the engineers' union (Amalgamated Society of Engineers) and began his career as a trade-unionist. In 1885 he became a Socialist. He was the first secretary of the London Reform Union (founded 1892) and of the National Democratic League, and was one of the first English labor leaders to ally himself with syndicalism. In 1912 he was arrested for a speech urging soldiers to refuse to shoot at strikers. He was found guilty and sentenced to six months' imprisonment, but served only about six weeks.

MANN, WILLIAM JULIUS (1819–92). An

American Lutheran theologian and author, born in Stuttgart, Germany. He studied there and at Tübingen and was ordained in 1841. Three years later he came to the United States with Dr. Philip Schaff and settled in Philadelphia. There he was assistant pastor (1850–63) and pastor (1863–84) of St. Michael's and Zion's Church. From its establishment in 1864 almost to his death he was professor of symbolics at the Lutheran Theological Seminary. With Dr. Schaff he edited *Der deutsche Kirchenfreund.* His own works include: *Plea for the Augsburg Confession* (1856); *Lutheranism in America* (1857); *Life and Times of Henry Melchior Muhlenberg* (1887). Consult his *Life* by his daughter, Emma T. Mann (Philadelphia, 1893).

MAN'NA (Heb. *mān,* Ar. *mann,* Gk. *μάννα, manna;* perhaps connected with the Egyptian *mennu*). According to the biblical account, the chief food of the Israelites during their 40 years' wandering in the desert (Ex. xvi; Num. xi. 6–9). It is described as falling from heaven like rain or with the dew; small, round and white, like coriander seed; in taste, sweet like honey, or like fresh oil. It was gathered in the morning and it melted when the sun arose. A sufficient amount was provided daily for each individual and no more; if a surplus was gathered it spoiled before the succeeding morning. On the sixth day, however, a double portion was provided, and none could be found on the Sabbath. It could be ground in a mill, beaten in a mortar, baked and made into cakes, or boiled. A command was given to preserve an omer of it in the ark of the covenant for future generations. (Cf. Heb. ix. 4.) The supply ceased on entrance into the promised land. (Josh. v. 12.) In Ex. xvi. 15 the name is explained by a reference to the exclamation of the Hebrews when they first saw the manna and knew not as yet what it was, *mān* being made equivalent to *mah,* "what is it?" This explanation is probably a species of popular etymology and indicates that the true origin of the word was unknown. In the later literature manna is called "corn" or "bread of heaven" and "angels' food." (Ps. lxxviii. 24–25, cv. 40; cf. John vi. 31; 1 Cor. x. 3.) Attempts have been made to explain the biblical manna as the exudation from the tarfa tree, a species of tamarisk (*Tamarix gallica mannifera*), or the camel's thorn, or as lichens. Manifestly such an explanation fails to satisfy all the conditions of the narrative. If it be believed, however, that the latter represents an early tradition with later embellishments, the view becomes plausible that the use of some such food by a small tribe or clan in time of need may have formed the basis of the narrative. The passage in Numbers is attributed to the Yahwistic writer, and hence is preëxilic; that in Exodus is found in the priestly narrative, but it probably embodies certain old fragments with considerable additions by the redactors. Consult the commentaries of Dillmann, Baentsch, and Strack on Exodus xvi. See COCCIDÆ.

MAN'NA. A sweet substance that exudes from incisions in the stems of *Fraxinus ornus* and other species of ash. The principal supply of manna comes from Sicily, where during July and August incisions are made in the trunks and larger limbs of the trees, and if the weather be warm the manna begins to ooze from the cuts and hardens into lumps or flakes which are removed by collectors. Manna is a light, porous substance of a yellowish color, not unlike dried honey. There are different qualities found upon the market, which vary in their purity and composition. Flake manna is obtained when there is an abundant flow from the upper incisions. It dries into flat pieces or tubes and differs somewhat in composition from the other varieties. Small, or talfa, manna occurs in tears from the lower incisions and is less crystalline and more gummy. Fat manna is brownish, viscid, noncrystalline, and is usually full of fragments of bark and other impurities. Manna is largely used in medicine as a laxative, demulcent, and expectorant, and is commonly administered with other medicines, as senna, rhubarb, etc. Its constituents, as reported by many investigators, are mannite 60 to 90 per cent, glucose, mucilage, fraxin, resin, etc. In addition to its value in medicine, manna has been extensively used for food, its value for this purpose depending upon the carbohydrates present.

In addition to that produced by various species of ash, manna or substances resembling it are excreted by many other species of plants. In Australia various species of Eucalyptus produce what is called manna or lerp. This saccharine substance is said to be without the laxative properties of true manna and is eaten as food. Similar substances are obtained in Australia from the tea tree (*Leptospermum scoparium*), sandalwood (*Myoporum platycarpum*), and Australian blue grass (*Andropogon annulatus*). During a famine in India a manna-like substance was exuded in sufficient abundance from a species of bamboo (*Dendrocalamus strictus*) to form an important food supply in some districts. It did not contain any mannite, the principal characteristic of true manna. Similar substances are obtained from the common larch of Europe (*Larix decidua*), the substance being known as Briançon manna; from *Quercus vallonea,* called Armenian manna; Persian manna from *Alhagi camelorum,* camel's thorn; tamarisk manna from *Tamarix gallica mannifera,* believed by some to have been the source of the manna of the Israelites, while others attribute it to a lichen, *Lecanora esculenta;* American manna, from the sugar pine (*Pinus lambertiana*); California manna, believed to be deposited from *Phragmites communis;* etc. Some insects, as *Lavinus mellificus,* secrete a similar material. All of these saccharine substances are usually grouped together as false manna. They contain as their principal constituent melitose or melezitose, but no mannite. A large number of plants yield small quantities of mannite. For a discussion of their chemical composition, consult Tollens, *Handbuch der Kohlenhydrate* (Breslau, 1895).

MAN'NA GRASS, FLOATING FESCUE, FLOATING SWEET MEADOW GRASS, ETC. (*Glyceria fluitans*). A perennial grass, 1 to 3 feet tall, found in marshes, ditches, and by the sides of stagnant pools in Europe, Asia, North America, and Australia. The stems are decumbent at the base and rooting at the joints; the leaves long and rather broad, the lower ones often floating; the inflorescence, a long, slender, nearly erect panicle. In irrigated meadows and in very wet grounds manna grass affords large quantities of cattle food. In many parts of Germany and Poland the seeds, which fall very readily out of the spikelets, are collected by spreading a cloth under the panicles and shaking them with a stick; they are used in soups and gruels, are very palatable and nutritious, and are known as Polish manna. There are a number of other

species of Glyceria, nearly all of which frequent moist soils. By some botanists they are all referred to the genus *Panicularia*.

MANNA INSECT. A scale insect (*Gossyparia mannifera*) which lives on tamarisk in many places in countries bordering upon the Mediterranean Sea and produces manna, which is a substance very like honey. It is surely a product of the insect and not a secretion of the plant, although formerly it was supposed to exude from the plant through punctures made by the insect. The insect is found in Algeria, Arabia, Armenia, and southern Russia. Formerly it was known as *Coccus manniferus*, or *Chermes mannifer*, the latter, the earliest name, having been proposed by Hardwick in 1822. See COCCIDÆ.

MAN'NERING, MARY (1876–). An American actress, born in London. She studied for the stage under Hermann Vezin and made her début as an actress at Manchester under her own name of Florence Friend in 1892. She appeared on the London stage in the same year and in 1896 was induced by Daniel Frohman to come to New York, where she began playing as "Mary Mannering" (the maiden name of her father's mother). She first starred at Buffalo, N. Y., in 1900, in the title rôle of *Janice Meredith*. Thereafter she played leading parts in *White Roses* (New York, 1901); *The Truants* (Washington, 1909); *The Independent Miss Gower* (Chicago, 1909); *A Man's World* and *The Garden of Allah* (New York, 1910). She was married to James K. Hackett (q.v.) and later to Frederick E. Wadsworth.

MAN'NERISTS. A term applied to painters and sculptors who make an exaggerated or unmeaning use of inherited or acquired forms, without independent study of nature and without understanding their significance. A work of art is mannered when the forms are inappropriate to the ideas expressed. The term Mannerists is most frequently applied to those Italian painters who were pupils of or immediately followed the leaders of the High Renaissance—especially Michelangelo, Raphael, Correggio—whose styles they imitated and exaggerated. See PAINTING.

MAN'NERS, CHARLES (1857–). An English basso and operatic impresario, born in London, his real name being Southcote Mansergh. Having studied in Dublin, London, and Italy, he began his career as a chorus singer in 1881. In the following year he made his début at the Savoy Theatre in Gilbert and Sullivan's *Iolanthe*. After a successful tour of the provinces he appeared at Covent Garden in 1890. On his return from a tour of South Africa he established the Moody-Manners Opera Company. His attempt to give opera in English met with such success in the provinces that in 1902 he gave a season in London, with the result that his season has become a fixture in the capital. Beginning with smaller works, the company gradually undertook works of a more exacting nature, until the repertory now includes all the great Wagner dramas, which thus were heard for the first time in the provinces. In 1890 he married Fanny Moody (born 1866), an excellent singer, who became the leading artist in his operatic company.

MANNERS, J. HARTLEY (?–). An American playwright, who was early an actor. His *Peg o' my Heart*, a comedy, played in New York from Dec. 20, 1912, to May 30, 1914, his wife, Laurette Taylor (q.v.), taking the leading rôle. It afterward had a long run in London. Manners's other plays include: *The Crossways; As Once in May; The Queen's Messenger; Zira*, with Henry Miller; *The Majesty of Birth; Ganton & Co.; The Girl and the Wizard; The Prince of Bohemia; The Girl in Waiting; A Woman Intervenes*. He published *Peg o' my Heart* in 1913, and *Happiness and Other Plays*, including *Just as Well* and *The Day of Dupes*, in 1914.

MANNERS, JOHN. A British general. See GRANBY, JOHN MANNERS, MARQUIS OF.

MANNERS, JOHN JAMES ROBERT, DUKE OF RUTLAND (1818–1906). An English statesman, born at Belvoir Castle, Leicestershire, Dec. 13, 1818. He was educated at Eton and at Trinity College, Cambridge. In 1841 he began his long parliamentary career in the Conservative interest, was twice Postmaster-General (1874–80 and 1885–86), and succeeded Earl Stanhope as chairman of the Copyright Commission. On the death of his brother (1887) he became seventh Duke of Rutland. Under Disraeli's influence he joined the Young England party, and with the former he toured the industrial districts of Lancashire, impelled by his zeal for industrial reform. In Disraeli's *Coningsby* (1844), *Sybil* (1845), and *Endymion* (1860) he figures more or less prominently. Among his publications are: *England's Trust and Other Poems; English Ballads and Other Poems* (1850); and notes of his Irish and Scottish tours of 1848–49. Consult Reginald Lucas, in *Dictionary of National Biography*, Second Supplement, vol. ii (London, 1912).

MANNERT, män'nērt, KONRAD (1756–1834). A German historian and geographer, born at Altdorf and educated at Nuremberg. In 1796 he became professor of history at Altdorf, in 1805 at Würzburg, in 1807 at Landshut, and in 1826 at Munich. His geographical works include the valuable *Geographie der Griechen und Römer* (10 vols., 1795–1825), with Ukert, and an edition of the *Tabula Peutingeriana* (1824); and among his historical labors the more important are: *Kompendium der deutschen Reichsgeschichte* (1803; 3d ed., 1819); *Kaiser Ludwig IV.* (1812); *Geschichte der alten Deutschen, besonders der Franken* (1829–32). Consult *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884).

MAN'NES, DAVID (1866–). An American violinist, born in New York City. At the age of 10 he took up the violin, without a teacher, and made considerable progress. After systematic study under H. Brode and C. Ritcher, he earned his living by playing in theatre orchestras. During the summers he went abroad and studied at different times with De Ahna, Halir, and Ysaye. In 1891 he was discovered by Walter Damrosch, who engaged him as one of the first violins for the New York Symphony Orchestra. From 1899 to 1911 he was concert master of this organization. The Sonata Recitals which he began in 1905 with his wife (Clara Damrosch) soon were recognized as events of importance. He always took deep interest in the affairs of the Music School Settlement, of which he became director in 1910. In 1912 he founded the Music School Settlement for Colored People.

MANNFELD, män'fĕlt, BERNARD (1848–). A German etcher. He was born in Dresden and as a boy studied painting under Otto Georgi, but later acquired a knowledge of architecture, which led him to take up etching. He

designed for the Seiler Institute for Glass Painting (Breslau) from 1866 till 1873, when he removed to Berlin. Three years later he published his first cycle of original etchings, entitled "Durchs deutsche Land," containing 60 plates of views of cities, buildings, and picturesque spots in Germany and Austria. He continued to make a specialty of architectural subjects and romantic landscapes, constantly improving his technique by studying the work of foreign etchers, particularly that of Axel Haig. He was employed by the state to etch some of the monuments in the National Gallery, Berlin, and in 1896 was called to the Stadel Institute, Frankfort (professor in 1900). Among his finest plates are "The Castle of Heidelberg"; "The Rheingrafenstein in Nahetal"; "The Albrechtsburg in Meissen"; "The Cathedral at Aix-la-Chapelle"; "View of Dresden"; "Old Bridge, Frankfort"; "Interior of Frankfort Cathedral."

MANNHARDT, mänˈhärt, Wilhelm (1831–80). A German mythologist, born at Friedrichstadt in Schleswig. He was educated in the universities of Berlin and Tübingen and became editor of the *Zeitschrift für deutsche Mythologie und Sittenkunde* (1855). His books on Germanic myth include: *Germanische Mythen* (1858); *Die Götter der deutschen und nordischen Völker* (1860); *Roggenwolf und Roggenhund* (2d ed., 1866); *Die Korndämonen* (1868); *Klytia* (1875); and his great works, *Wald- und Feldkulte* (1875–77; 2d ed., by Heuschkel, 1904–05) and *Mythologische Forschungen* (ed. by Patzig, 1884). Consult *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884).

MANNHEIM, mänˈhīm. The largest city of the Grand Duchy of Baden, at the confluence of the Rhine and Neckar, 43 miles southwest of Frankfort (Map: Germany, C 4). It is the third largest city on the Rhine, surpassed only by Cologne and Düsseldorf; since its connection by railroad with all important cities in the German Empire it has become the first commercial town in the Grand Duchy of Baden. The site of the town is low, and a high dike protects it from floods. The Rhine, which is here 1200 feet in breadth, is crossed by a railway bridge which connects Mannheim with Ludwigshafen; a chain bridge spans the Neckar. The town is remarkable for its cleanliness and is the most regularly built town in Germany; the main part is divided into 136 square sections and is encircled by a semicircular boulevard known as the Ring Strasse. Outside of the semicircle are numerous suburbs. The palace, built 1720–29, by the Elector Palatine Charles Philip, with a front of over 1700 feet, and 1500 windows, is one of the largest buildings of the kind in Germany. It has several museums, containing paintings by Van Ruysdael and Rubens, and a library of 66,000 volumes. The city contains a Gymnasium with a library, a botanic garden, an observatory, an ancient merchants' hall, the National Theatre, founded in 1776, in which Schiller's *Robbers* was first acted, and the large concert hall. Among notable public monuments are those of William I, Prince Bismarck, Schiller, and Moltke. The Schlossgarten, bordering on the Rhine, is the chief of the five public gardens surrounding the city. Since the construction of harbors (covering 240 acres) and extensive docks in 1875 and 1897, Mannheim has had a great and increasing trade in grain, coal, petroleum, tobacco, sugar, and ironware. Its metal and machine works, including the manufacture of agricultural implements, gasoline, and electric motors, give employment to 10,000 persons; 2000 are engaged in a celluloid factory. Cigars, varnish and rosin, carpets, rubber, cables, railway supplies, wire, stoves, chemicals, oil, furniture, brushes, mirrors, sugar, mattresses, glass and leather goods are also manufactured. Its institutions include Gymnasia, a reformatory, a trade school, a marine school, and a conservatory of music. Pop., 1885, 61,273; 1900, 140,384; 1910, 193,902. The United States is represented by a consul.

Mannheim is mentioned as a village as early as 764. Its prosperity dates from 1606, when, under the Elector Palatine Frederick IV, it became the refuge of religious exiles from the Netherlands. It suffered severely in the Thirty Years' War and was almost totally destroyed by the French in 1689. After being rebuilt it was again occupied by the French in 1795 and a large part of it burned. In 1802 it was given to Baden.

MANˈNING, Daniel (1831–87). An American journalist, financier, and politician. He was born in Albany, N. Y., and at the age of 10 entered the printing office of the Albany *Atlas* as an apprentice. After the consolidation of the *Atlas* with the *Argus* he was appointed legislative reporter, in which capacity he made a wide acquaintance among politicians and became known as an authority on State political affairs. In 1865 he became editor and part owner of the *Argus*, and president of the company in 1873. In 1876 he was elected a member of the New York Democratic State Committee, of which he became secretary in 1879 and chairman in 1881. In this position he was associated closely with Grover Cleveland, to whose election as Governor of New York he contributed greatly in 1882. To Manning's astuteness and tact also was largely due the successful presentation of Cleveland's name as a candidate for the presidency in 1884, and to his personal supervision of the campaign was largely due the success of the Democratic ticket in the pivotal State of New York. President Cleveland occasioned considerable surprise when he appointed Manning Secretary of the Treasury. Manning remained in office until 1887, and his able administration justified his appointment. He retired shortly before his death, on account of ill health.

MANNING, Henry Edward (1808–92). An English Roman Catholic prelate, one of the most notable figures in the Church life of his time. He was born July 15, 1808, at Totteridge, in Hertfordshire, and educated at Harrow and at Balliol College, Oxford, where he graduated in 1830. He was ordained in the Church of England in 1832, married in 1833, and in 1834 appointed rector of Lavington and Graffham in Sussex. His wife died in 1837. Manning devoted himself with increasing zeal, energy, and success to the work of his profession, and was recognized, though still a young man, as a leading figure in the group of Tractarian leaders. His appointment in 1840 as Archdeacon of Chichester gave him a still more influential position. Newman's secession affected him painfully and for a time seemed to increase his attachment to the Church of England; but in 1851 the decision in the noted Gorham case (see Gorham Controversy), which seemed to claim for the crown authority over a purely doctrinal question, shook his allegiance. After long and arduous consideration he made his submission to the Roman

Catholic church in 1851. Only two months later —an unusual recognition of his gifts and his theological attainments—he was ordained priest by Cardinal Wiseman. He made some further studies in Rome, and from 1852 to 1856 was informally connected with the Jesuit Church in Farm Street, London, finding much to do in preaching and spiritual direction. In 1857 he developed an English congregation of priests known as Oblates of St. Charles, a revival of the community founded at Milan by St. Charles Borromeo, and became its first superior. The same year saw his appointment as provost of the Chapter of Westminster, which brought him into close relations with Cardinal Wiseman, then Archbishop. In the difficult circumstances connected with the insubordinate attitude of Archbishop Errington, Wiseman's coadjutor, Manning was a loyal supporter of the Cardinal and of great service. On the latter's death in 1865, Pius IX took the unexpected step of appointing Manning his successor as Archbishop of Westminster, and for the next quarter of a century he occupied a commanding position in the religious life of England. He not only did much to bring the Roman Catholic body out of the obscurity in which centuries of repression had left it, but he was indefatigable in all kinds of good works—the care of the poor, religious education, and very prominent in social and temperance work. In the Vatican Council of 1870 he took a prominent part, standing among the pronounced advocates of defining papal infallibility, and engaging in a controversy, famous at the time, with Monseigneur Dupanloup, Bishop of Orléans. His *Petri Privilegium* (1871) is an exposition of the doctrine and an account of the proceedings. On the same subject he also published (1875) an answer to Gladstone's expostulations, giving his views of the bearing of the Vatican decrees on civil allegiance; and in 1877 he wrote *The True Story of the Vatican Council.* Among Manning's other published works are: *The Temporal Mission of the Holy Ghost* (1865); *The Internal Mission of the Holy Ghost* (1875); *England and Christendom* (1867); *Sin and its Consequences* (1876). His manifold services were recognized by the gift of a cardinal's hat in 1875. He died in London, Jan. 14, 1892.

Bibliography. The fullest biography of him is by E. S. Purcell (2 vols., London, 1896), which is unfortunately disfigured by many misleading inferences and grave faults of taste; it may be corrected in particular as to the facts of the Errington case by Wilfrid Ward's *Life and Times of Cardinal Wiseman* (London, 1897). There is a shorter but in many ways more satisfactory biography by A. W. Hutton (Boston, 1892). Consult also: Francis de Pressensé, *Life of Cardinal Manning* (Philadelphia, 1897); P. H. Fitzgerald, *Fifty Years of Catholic Life and Social Progress* (London, 1901); I. A. Taylor, *The Cardinal Democrat* (St. Louis, 1908); Paul Thureau-Dangin, *English Catholic Revival in the Nineteenth Century* (2 vols., London, 1914); and a number of the biographical works cited under OXFORD MOVEMENT.

MANNING, JAMES (1738–91). An American educator. He was born in Elizabethtown, N. J., graduated at Princeton College in 1762, and was ordained to the Baptist ministry in 1763. Coöperating with an association of Baptist ministers in Philadelphia, he went to Rhode Island and proposed to the Baptists in Newport a plan for the establishment of a "seminary of polite literature, subject to the government of the Baptists." A charter was obtained in 1764. The next year Manning was appointed president of the institution, which was opened in 1766 as the College of Rhode Island (later Brown University). He served in that office (except during the Revolution, when the school was closed) till 1790, when he resigned. During the greater part of this period he was also pastor of the First Baptist Church in Providence, founded by Roger Williams. His chief educational publication, *Report in Favor of the Establishment of Free Public Schools in the Town of Providence,* indicates his activity in another direction. In 1786 he was elected to the Congress of the Confederation. He was an active Federalist, and it was due largely to his influence that Rhode Island adopted the Constitution and came into the Union. Consult R. A. Guild, *The Life, Times, and Correspondence of James Manning, and the Early History of Brown University* (Boston, 1864). See BROWN UNIVERSITY.

MANNING, ROBERT (1784–1842). An American pomologist, one of the pioneers in horticultural nomenclature. In order to determine the value of varieties he established at Salem, Mass., a fruit garden, in which he raised varieties of all fruits that could withstand the rigor of the climate of that State, and in which at the time of his death nearly 2000 varieties were growing. He published a descriptive catalogue, called *Book of Fruits,* in 1838. Manning was one of the founders of the Massachusetts Horticultural Society, and during his later years was recognized as an authority on horticultural matters, especially on fruit varieties.

MANNING, THOMAS (1772–1840). An English traveler, born Nov. 8, 1772, at Broome, Norfolk, where his father was rector. In 1790 he entered Caius College, Cambridge, where he became distinguished in mathematics; but he left without a degree, owing to his unwillingness to take the oaths. From 1800 to 1803 he studied Chinese in Paris. In 1806 he went out to Canton as doctor. In 1810 he proceeded to Calcutta, whence he made his way into Tibet to Lhasa (1811). He was the first Englishman to enter the Holy City. On returning to England in 1817, after a visit to Peking, a shipwreck near the Sunda Islands, and a call on Napoleon at St. Helena, he lived for several years at a cottage called Orange Grove, near Dartford, in the midst of his Chinese books. There he was visited by the chief literary men of the day. One of his many eccentricities was a long, flowing beard. This he plucked out by the roots before leaving Orange Grove for Bath, where he died May 2, 1840. Manning was familiar with 15 languages and was esteemed the first Chinese scholar in England in his day. Charles Lamb made the acquaintance of Manning in 1799, and a memorable friendship ensued. Consult: Charles Lamb's *Letters* and *Essays of Elia* ("The Old and the New Schoolmaster" and "A Dissertation on Roast Pig"); also the *Narratives of the Mission of G. Boyle to Tibet and of the Journey of T. Manning to Lhasa,* edited with memoirs by Sir C. R. Markham (London, 1876); W. P. Courtney, in *Dictionary of National Biography,* vol. xxxvi (ib., 1893).

MANNING, THOMAS COURTLAND (1831–87). An American jurist, born at Edenton, N. C. He was educated at the University of North Caro-

lina, was admitted to the bar, and practiced for a time in his native town. In 1855 he removed to Alexandria, La., and built up a large practice. After serving as a member of the Secession Convention, he entered the Confederate army as a lieutenant and in 1863 became adjutant general with the rank of brigadier general. He was a member of the Louisiana Supreme Court (1864–65) and in 1872 a Democratic presidential elector. In 1876 he was temporary chairman of the Democratic National Convention. He was a second time presidential elector in 1876 and in 1880 was appointed to the United States Senate, but the Committee on Elections and Privileges declined to consider his credentials. From 1877 until the adoption of the new Constitution he was Chief Justice of the State Supreme Court. From 1882 to 1886 he was again justice of the Supreme Court and during 1886–87 was United States Minister to Mexico, where he died. He was also trustee of the Peabody Fund from 1880 until his death.

MANNING, William Thomas (1866–). An American Protestant Episcopal clergyman. He graduated B.D. from the University of the South in 1893; was ordained a deacon in 1889 and a priest in 1891; and served as rector at Redlands, Cal. (1892), at Lansdowne, Pa. (1896–98), and at Nashville, Tenn. (1898–1903). For two years (1893–95) he was professor of dogmatic theology at the University of the South. In New York City he was vicar of St. Agnes's Chapel in 1903–04, assistant rector in 1904–08, and thereafter rector, of Trinity parish.

MANNINGTON. A city in Marion Co., W. Va., about 20 miles north of Clarksburg, on the Baltimore and Ohio Railroad (Map: West Virginia, D 2). It has a large pottery, extensive oil and gas interests, glassworks, machine shops, and rich coal mines. The water works are owned by the city. Pop., 1900, 1681; 1910, 2672.

MAN'NINOSE. See Clam.

MAN'NITE, or Mannitol (from *manna*), $C_6H_8(OH)_6$. A hexahydric alcohol found in the manna from *Fraxinus ornus* (Linné), which grows in the basin of the Mediterranean. It was discovered in that manna by Proust in 1806 and may be readily extracted from it with hot water or boiling alcohol. It is found also in many other vegetable products, including onions, celery, asparagus, many fungi, etc.; and it has been prepared artificially from the sugar mannose by reduction with sodium amalgam. Vice versa, careful oxidation of mannite with nitric acid yields mannose. A mixture of mannite and a very similar hexahydric alcohol called sorbite is produced when ordinary fructose (levulose) is reduced with nascent hydrogen (sodium amalgam). Mannite is also produced during alcoholic fermentation, particularly at higher temperatures, and a special mannitic fermentation often occurs in wines, changing the fructose contained in them into mannite. However, the amount of mannite generally discoverable in unspoiled wine is very small. Mannite may be obtained either in the form of rhombic prisms or in the form of silky needle-like crystals; it melts at 165–166° C. (329–330.8° F.), and it is readily soluble in hot water or alcohol, but only moderately soluble in cold water, and scarcely soluble at all in cold alcohol or in ether. Its pure aqueous solution has a very slight action on polarized light; the action is, however, greatly increased by the presence of free alkali as well as of certain salts, especially borax. The constitution and configuration of mannite are represented by the formula:

$$\begin{array}{ccccccccc} & & OH & & OH & & H & & H \\ & & | & & | & & | & & | \\ (CH_2OH) & . & C & . & C & . & C & . & C \;.\; (CH_2OH) \\ & & | & & | & & | & & | \\ & & H & & H & & OH & & OH \end{array}$$

The hexahydric alcohols *sorbite* (see above), *dulcite*, *idite*, and *talite* have the same composition and constitution as mannite, and differ from it and from one another only in their configuration, i.e., in the arrangement of their atoms in space. (See Stereochemistry.)

MANNLICHER, män'lik-ēr, Ferdinand von (1848–1904). An Austrian engineer and inventor. He was born at Mainz, Germany, and for many years served as chief engineer of the Imperial Northern Railroad (Kaiser Ferdinands Nordbahn). In 1899 he was called to the Austrian Upper House in recognition of his public services. He became widely celebrated through his many inventions and improvements in military small arms and to him was due the original Mannlicher rifle, which with modifications was used in the military services of several European and other nations. See Small Arms.

MANNS, mäns, Sir August (1825–1907). A German-English musical conductor, born at Stolzenberg, Pomerania. He received his early training in music from a village musician and from Urban, the town musician of Elbing. He became a member of a military band at Danzig, then at Posen, and in 1848 joined Gungl's orchestra in Berlin. Soon after he became conductor and first violin at Kroll's Garden, Berlin. In 1851 Von Roon, the War Minister, selected Manns as bandmaster of his regimental band, first at Königsberg, then at Cologne. In 1854 he became assistant conductor, and in 1855–1905 was conductor, at the Crystal Palace, London, where he accomplished important results in the furtherance of the newer romantic music of Germany. He also changed the original wind band into an orchestra and founded (1856) the famous Saturday concerts, which he continued till 1901. He conducted the Glasgow Choral Union (1879–92) and six triennial Handel festivals. He was knighted in 1903. Consult H. S. Wyndham, *August Manns and the Saturday Concerts: A Memoir and a Retrospect* (London, 1909).

MAN'NUS (according to some, connected with Goth. *manna*, AS., Eng., OHG. *man*, Ger. *Mann*, Skt. *manu*, man, the mythical father of the human race). According to Tacitus (*Germania*, chap. ii), the name given by the Germans to the son of the earthborn god Tuisto. From his three sons they derived their three great tribes, the *Ingævones*, the *Herminones*, and the *Istævones*. Mannus belongs, not to the Teutonic people alone, but to the great myth of the origin of the human race, common to the whole Aryan family, and, like the Hindu *Manu* (q.v.) or *Manus*, stands forth as the progenitor of the inhabitants of earth endowed with reason. Consult K. Müllenhof, *Deutsche Altertumskunde*, vol. iv (revised by M. Roediger, Berlin, 1900).

MANNY, Sir Walter, Baron de (?–1372). An English adventurer, born in Hainault, France. He first appeared in England probably in 1327 as an esquire of Queen Philippa. He was engaged in the Scottish wars in 1331–37 and again in 1341; had command of English fleets in 1337 and 1348; served under Edward

III in the wars in France between 1338 and 1360; and was second in command in the invasion of France by John of Gaunt in 1369. He served as a baron by writ in Parliament in 1347–71 and was knighted in 1359. Much space is given to his exploits in Froissart's Chronicles (Eng. trans., London, 1895). He is chiefly known as one of the founders of the Charterhouse in London.

MAN'NYNG, Robert (or Robert de Brunne) (flourished c.1290–1340). An English poet, native of Brunne, or Bourne, in Lincolnshire. In 1288 he joined the neighboring brotherhood of Gilbertine canons at Sempringham. There he wrote *Handlyng Synne* (1303), a free paraphrase of the *Manuel des Pechiez* by William of Wadington. It depicts, with much sharp satire, the social life of the time. The best manuscript (the Harleian), with the French original, was edited by F. J. Furnivall for the Roxburghe Club in 1862. In 1338 Mannyng, then resident in the Gilbertine priory of Sixhill, Lincolnshire, finished his *Chronicle of England.* It has little historical value, as it closely follows the earlier chronicles. The earlier part of the *Chronicle* was edited by Furnivall for the Rolls Series (London, 1887); and the latter part by T. Hearne in 1725. To Mannyng is also attributed *Meditacyuns of the Soper of oure Lorde Ihesus,* edited for the Early English Text Society (London, 1875). Consult T. L. K. Oliphant, *Old and Middle English* (London, 1878), and B. A. K. Ten Brink, *Early English Literature to Wiclif,* translated by H. M. Kennedy (New York, 1883).

MANOA, mȧ-nō'ȧ. A fabulous city said to have been built on an island in Parima Lake, Guiana, and governed by El Dorado (q.v.).

MANOANS. See Conibo.

MANOBO, mȧ-nō'bō. The Manobo is a powerful pagan tribe inhabiting the lower Agusan River valley in Mindanao. They closely resemble the Mandaya in bodily appearance and culture and, like them, are frequently tree dwellers. They practice a crude agriculture and are somewhat skilled in forging iron knives and spear heads. For centuries they have been slaveholders, and their extensive raids into the territory of neighboring tribes have caused them to be greatly dreaded. They probably number more than 50,000. See Philippine Islands.

MANOEL, mä'nō-ȧl'. The Portuguese form of Manuel (q.v.).

MANOEL DO NASCIMENTO, mä'nō-ȧl' dō nä'shē-mȧn'tō, Francisco. A Portuguese poet. See Nascimento, Francisco Manoel do.

MANŒUVRES, mȧ-nōō'vẽrz (Fr. *manœuvre,* OF. *manouvre, manovre,* from ML. *manuopera, manupera,* a working with the hand, from Lat. *manus,* hand + *opera,* work). Exercises of large or small bodies of troops, designed to teach in time of peace the duties of troops in war. Manœuvres are conducted in two ways: (1) by field exercises on the terrain itself, during which actual bodies of troops are manœuvred in accordance with the tactical principles involved; (2) on special maps, where the movements of troops are indicated by colored bits of paper. The latter are known as "map manœuvres" and are finding increasing favor in the instruction of officers in all armies. (See War Game.) In Europe field manœuvres are carried on in most great armies throughout the year, the grand manœuvres (of one or more army corps) usually taking place in the autumn, and simulating the conditions of war as closely as possible. In the United States there are similar operations, usually held in the fall, in which the regular army and the militia participate.

Naval manœuvres and the combined manœuvres of sea and land forces working in harmony are of more recent origin than their military counterpart. Frederick the Great of Prussia first conceived the idea of having sham battles between his troops, an idea which Napoleon utilized in the great camp of Boulogne in 1805, during his preparation for the invasion of England. It was Von Moltke, however, and the Prussian general staff who first developed the idea of manœuvres into its full modern significance, and in the combined naval and military operation around the city of Flensburg in Schleswig-Holstein (1890) set an example which was soon copied. The United States naval and military manœuvres held in 1902 in the vicinity of New York followed practically the same plan of campaign as did Germany in the instance already cited. England and France and the United States hold periodical naval manœuvres, the problem usually being the attack or defense of shore defenses. In naval manœuvres particularly, conditions may be created which are faithful replicas of actual battles and campaigns. Besides their value in the formulation of the most effective scheme of shore defense against attack or invasion, they are just as important in the training under war conditions of the naval personnel, besides which they afford commanders excellent experience in the practice of battle tactics and strategy. Flaws in methods and material which otherwise might not be discovered until too late are noted and subsequently remedied; new ideas in the application of strategical or tactical principles carried out; the employment of torpedoes, mines, destroyers, submarines, wireless telegraphy, searchlights, air craft, and the various experiments in coaling at sea thoroughly tested; and the whole carefully observed and noted by officers of the national government appointed for the purpose, whose report usually forms the basis for future naval legislation. See Tactics, Military; Tactics, Naval; War Game.

MAN OF BLOOD, The. A designation applied by the Puritans to Charles I of England.

MAN OF BLOOD AND IRON, The. A name given to Prince Bismarck, originating in a phrase used by himself in regard to the settlement of the differences of Prussia and Austria.

MAN OF DECEMBER, The. Napoleon III, so called because of his coup d'état of Dec. 2, 1851.

MAN OF DESTINY, The. A name given to Napoleon Bonaparte, who considered himself specially chosen and directed by fate.

MAN OF LAW'S TALE, The. One of Chaucer's *Canterbury Tales.* It is the story of Constance, told in Gower's *Confessio Amantis,* and taken from old French romances.

MAN OF MODE, The, or Sir Topling Flutter. A comedy by George Etherege, presented in 1676.

MAN OF SIN. See Antichrist.

MAN-OF-THE-EARTH. A weed. See Ipomœa.

MAN-OF-WAR. An armed naval vessel regularly commissioned by some acknowledged government and fitted for purposes of war. As such she possesses the privileges of war; her

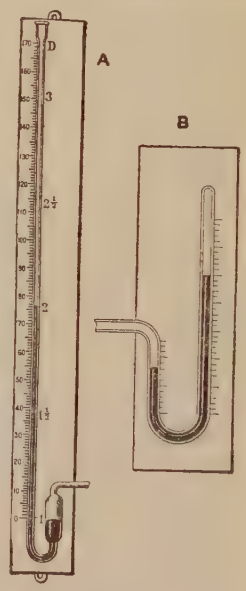
deck is, by a legal fiction, taken to be a portion of the soil of the nation whose flag she hoists; in time of war she is justified in attacking, sinking, burning, or destroying the ships and goods of the foe, and, by the law of nations, she may stop and search the merchant vessels of neutral powers which she suspects of carrying aid to her enemy. (See INTERNATIONAL LAW; CONTRABAND OF WAR; NEUTRALITY.) In case of being overpowered the crew of a man-of-war are entitled to the ordinary mercy granted to vanquished combatants lawfully fighting. Any vessel making war, but not belonging to an acknowledged government, is technically either a privateer (see MARQUE, LETTERS OF) or a pirate, but the naval war waged by vessels belonging to insurgents is not regarded as piracy if solely directed against the forces of the government they are fighting (see PIRACY). See BATTLESHIP; CRUISER; FRIGATE; SHIP, ARMORED; SHIPBUILDING; NAVIES; RAM; MORTAR VESSEL; TORPEDO BOAT.

MAN-OF-WAR, PORTUGUESE. See PORTUGUESE MAN-OF-WAR.

MAN-OF-WAR BIRD, or **HAWK** (so called from its predatory habits). A frigate bird (q.v.); but occasionally the term is applied to some other swift and predacious sea fowl, as a skua.

MAN'OGRAPH (from Gk. *μανός, manos,* thin, and *γράφειν, graphein,* to write). An instrument designed to render visible to the eye the varying pressure in an engine cylinder or other confined space in which the pressure changes with a cyclically varying volume. (See INDICATOR.) It is specially adapted for the high speeds and high temperatures of the internal-combustion motor. (See GAS ENGINE; INTERNAL-COMBUSTION ENGINE.) The fundamental principle is to have the pressures of the cylinder received upon a steel diaphragm of calibrated resistance to deformation by such pressure. The yielding of the diaphragm to pressure is measured by the motion of a very small mirror, which reflects a ray of light from an electric arc. The flexure of the diaphragm moves the mirror around an axis and causes the beam of reflected light to move vertically over a ground-glass surface in its path. The rise and fall of the spot of light measures the pressure on the diaphragm. To relate the position of the spot of reflected light to the position of the piston of the engine the mirror receives from the engine shaft a synchronous movement of rotation through a small angle around an axis at right angles to that of its motion from pressure. The position of the spot of light is therefore at any instant the resultant of the pressure and of the piston motion. The spot of light will therefore trace a diagram like an indicator diagram in which vertical ordinates are pressures and horizontal displacements or abscissas are the piston motions or cylinder volumes. If the ground glass for optical observation be replaced by a sensitized photographic plate a diagram of pressure and volume relations is photographically recorded. The manograph has very little inertia or friction; its motion is very small and the multiplication of motion is done optically and without complications. The objection to it is the uncertainty whether the known static pressures of calibration produce the same movement of the diaphragm as the dynamo's impact of the cylinder pressures, and whether the latter are translatable into the same units as the former.

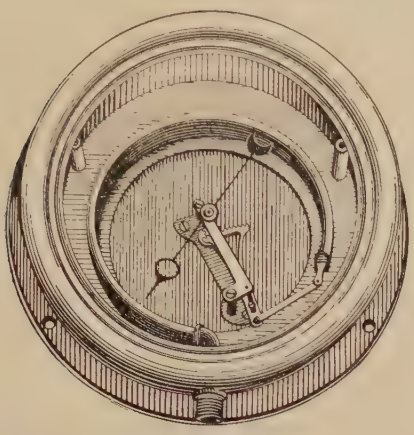
MANOM'ETER (from Gk. *μανός, manos,* thin, rare + *μέτρον, metron,* measure). An instrument for measuring the density or pressure of the air or any gas. A barometer (q.v.) is one form of manometer, as the pressure of the atmosphere is measured by the height of the column of mercury which it supports. The manometer in its simplest form would be a glass tube open at both ends and bent into the form of a U and containing a sufficient quantity of some liquid to cover the bend and rise to a small height in each arm. The vessel containing the gas whose pressure is to be ascertained is connected with one arm of the tube, and if the gas is at the same pressure as the atmosphere the liquid will stand at the same level in both tubes. If the gas is at a greater pressure the liquid in the arm of the tube on which it acts will be at a lower level, and the pressure of the gas will be obtained by adding to the pressure of the atmosphere the weight of a column of the liquid whose height is equal to the difference in level in the two tubes. When the pressure of the gas is considerably greater than that of the atmosphere we use mercury on account of its high specific gravity, and when the pressures are sufficient a tube with one arm closed can be employed and the pressure determined by measuring the extent to which the air is compressed. Now, according to Boyle's or Mariotte's law, a pressure exerted on the column of mercury sufficient to force the air into half the space it occupies at the normal atmospheric pressure must become doubled, or 15 pounds to the square inch must be added. Again, to compress the air into half the remaining space, 30 pounds, or double the pressure required for the reduction to the first half, must be added, making in all a pressure of four atmospheres for the reduction to one-fourth the original volume. It is evident, therefore, that a graduated scale, to exhibit the degrees of pressure, must have its spaces decrease from below upward. If the gas is considerably rarer than the air, as, e.g., in the receiver of an air pump, we employ a shortened barometer consisting of a bent tube with one end closed but filled with mercury, which is supported by the pressure of the atmosphere. In this case the pressure is measured by the difference in level of the two columns, which would be zero were the vacuum perfect.



MANOMETER.
A, for pressures greater than one atmosphere; *B*, for pressures less than one atmosphere.

These manometers are of course constructed in various forms, depending upon the use to which they are to be put, and the tubes and air chambers are variously constructed. The most common form of manometer is the steam gauge, which may be either a piston actuated by the

pressure to move an indicator against the force of a spring, or more commonly a metal tube of elliptical cross section bent into circular shape. One end of this tube is permanently fastened to the case of the instrument and through it the steam or gas enters, while the other end is closed but free to move. It is connected with a spring



BOURDON PRESSURE GAUGE, WITH FACE REMOVED.

and a series of levers, so that its motion, which depends upon the pressure, is communicated to an indicator moving over a scale graduated usually in pounds in the United States and England and atmospheres in Europe. These steam gauges must of course be adjusted and calibrated by reference to some direct source of pressure, such as would be furnished by a column of liquid in a vertical tube. See MANOGRAPH.

MANON, mȧ'nôn'. An opera by Massenet (q.v.), first produced in Paris, Jan. 19, 1884; in the United States (New York), Dec. 23, 1885.

MAN ON HORSEBACK, THE. A name given to the French General Boulanger (q.v.), who usually appeared in public riding a black horse.

MANON LESCAUT, mȧ'nôn' le-skō'. A noted romance by the Abbé Prévost. It was published in 1731 and was originally only an episode of his *Mémoires d'un homme de qualité.*

MANON LESCAUT. An opera by Puccini (q.v.), first produced in Turin, Feb. 1, 1893; in the United States (New York), Jan. 18, 1907.

MAN'OR (Fr. *manoir,* from Lat. *manerium,* a dwelling place, from *manere,* to abide, to dwell). A district of land held by "some baron or man of worth" by freehold tenure of the king or of some mesne lord, within which the lord of the manor exercises a certain jurisdiction in addition to his rights as landlord. The term "manor" to describe such a lordship did not come into use in England till some time after the Norman Conquest, but the institution is found in a less-developed form among the Anglo-Saxons. The typical manor, in its later development, consisted of two parts: (1) the inland (demesne) or home estate, which the lord held in his own hands, upon which his house was built, and which was farmed by nonfree, peasant occupiers, and (2) the outland (geneatland), which was held, in part at least, by freemen as freehold tenants, holding of the lord at a rent, which might be money, or produce of the land, or military or other service. The tenants proper were freemen, but most of the occupiers who constituted the lord's dependents, belonged to one or more of the classes of the unfree (as villeins), who constituted the bulk of the peasant population. These for the most part dwelt together in villages and lived ordinarily by agriculture. It is held by writers like Gneist, Stubbs, and Freeman that originally there were few manors, but that they gradually increased in number, until in the twelfth century the prevailing system of society, outside the boroughs or incorporated towns, was that of manors with dependent peasants. The origin of the manor is obscure, some authorities, as Seebohm, holding it to be due to the imposition of the system of the Roman villa on the servile population by the Norman invaders; others, like Maitland, seeing in it a normal development of the village community.

As has been said, the lord of a manor might hold directly by grant of the king, who was, under the feudal system, the supreme landowner, the lord paramount, of all lands in the kingdom, in which case his customary jurisdiction, based upon and derived from the ancient customs of his manor, might be restricted or enlarged by the royal grant; or he might hold under some mesne lord, who in his turn held the manor, together with other lands, directly of the crown. With the growth of the process of subinfeudation, i.e., of the granting of lands by a tenant to be held of himself as overlord, the latter method of holding manors became common in the thirteenth and fourteenth centuries. Where one lord held two or more manors, whether of the king or of a mesne lord, the entire estate was known as a lordship or honor.

MANOR HOUSE. The residence of the lord of the manor. This was an important subject of architectural design under the Tudor kings in England, when such manor houses were built as Loseley, Westwood, Levens Hall, North Cadbury, and many others. Under Elizabeth and James I (1558–1625) the manor house was developed to imposing proportions upon monumental plans with sumptuous decorations and furnishings (Wollaton House, Longleat, Burghley, Aston, Bramshill, Hatfield, and scores of others).

MANO'RIAL COURT. See MANOR.

MANOURY, GENERAL. See VOLUME XXIV.

MAN-RAISING KITE. See MILITARY OR MAN-RAISING KITE.

MANRESA, mȧn-rā'sȧ. A town in the Province of Barcelona, Spain, 30 miles northwest of the city of that name (Map: Spain, F 2). It is picturesquely situated on the left bank of the Cardoner, and in an amphitheatre of hills crowned by a large Gothic cathedral of the fourteenth century. It has a high school, conducted by the Jesuits, and in the neighborhood are the convent of Santo Domingo, built near, and the church of San Ignacio, built over, the cave in which Ignatius of Loyola dwelt for a year, and which is on that account a place of pilgrimage. The surrounding region is irrigated by a canal fed by the Llobregat River. Manresa has manufactures of cotton and woolen yarns and silk fabrics. In 1811 it was set on fire by Marshal Macdonald. Pop., 1900, 23,416; 1910, 23,036.

MANRIQUE, mȧn-rē'kȧ, GÓMEZ (?1415–?1490). A Spanish poet, dramatist, soldier, and statesman, born of a noble family. Unfortunately, from a literary point of view, he was the nephew of the Marqués de Santillana (q.v.) and the uncle of Jorge Manrique (q.v.), both of

whom are more celebrated than he. None the less he played an important part in the disturbances of the reigns of John II, Henry IV, and Isabella II. In his earlier lyrics he adhered to the Gallegan methods, but he soon affiliated himself with the movement that aimed to Italianize Castilian poetical forms. He attained some success in the composition of the political satire, but the pathetic note is the most distinctive one in his lyrics. Gómez also essayed the drama in several pieces, the best of which is the liturgical play, *Representación del nacimiento de Nuestro Señor*. But he tried also a couple of *momos* that are not without merit. In short, he foreshadowed both the sacred and profane elements in the Spanish drama. Consult his *Cancionero*, edited by A. Paz y Melia (2 vols., Madrid, 1885–86), and Marcelino Menéndez y Pelayo, *Antología de poetas líricos castellanos*, vol. vi (ib., 1896).

MANRIQUE, Jorge (?1440–1479). A Spanish poet and soldier, nephew of Gómez Manrique (q.v.). He fell in the battle of the fortress of Garci-Múñoz, when yet hardly old enough to have attained the fullness of his poetical power. The greater part of his verse, preserved in the *Cancionero general* of 1511 and in other *cancioneros*, gives little evidence of any extraordinary merit in him, and his fame is really based on a single poem, that written in commemoration of the death of his father, the Maestre de Santiago. This suffices, however, to make his name one to be remembered as long as his language remains intelligible. In verses mournfully sweet of tone the exquisite *coplas* of this composition proclaim the vanity and brief duration of all things terrestrial and the necessity of yielding to death, as even the most powerful and exalted of human beings have had to do. Longfellow's graceful translation of the poem has preserved much of the dignity and pathos of the original. The Spanish text may be found in *Biblioteca de autores españoles*, vol. xxxv (Madrid, 1782), and in the *Bibliotheca Hispanica*, vol. xi (ib., 1902), Jorge Manrique, *Coplas por la muerte de su padre* (ed. R. Foulché-Delbosc). Consult also Marcelino Menéndez y Pelayo, *Antología de poetas líricos castellanos*, vol. vi (ib., 1896).

MANS, mäns, or **MAN-TSE,** män′tsĕ′. An aboriginal people occupying some of the mountainous parts of the Chinese provinces of Szechwan and Yunnan, portions of Tongking, etc., a division of the Mois (q.v.). During the last half century they have been forced more and more into the hills. The Mans are short in stature and mesocephalic. They are more or less nomadic and do not mix readily with other peoples of the country. They are looked upon as part of the aboriginal population of Szechwan, driven back into Yunnan about the third century A.D. by the advance of the Chinese, and now moving seaward along the heights of land. The Mans and the Lolos (q.v.) seem to be linguistically related. Consult Verneau in *L'Anthropologie* (Paris, 1896).

MANS, män, Le. The capital of the Department of Sarthe, and formerly of the Province of Maine in northwest France. It is situated in the centre of the department, on a hill above the left bank of the river Sarthe, 116 miles southwest of Paris (Map: France, N., F 4). It is an old town, but has some wide streets, many monuments, and several parks and promenades. The most notable building is the cathedral of St. Julien, which is one of the most beautiful churches of France. It was built in the period between the eleventh and the fifteenth centuries, and has a magnificent choir built in pure Gothic style and some beautiful stained-glass windows. It holds the tomb of Berengaria, the Queen of Richard Cœur de Lion. The church of Notre Dame de la Couture is also noted for its sculptures. The town has a seminary, two normal schools, a school of music, a lyceum, a museum of natural history, a public library containing 53,000 volumes and 600 manuscripts, and paintings by Corot, Constable, Ruysdael, and Troyon. There are also excellent museums of natural history, art, and archæology. The principal manufactures are chemicals (especially sulphuric acid), tobacco, sailcloth, instruments and clocks, cereals, cordage, oil, paints, leather, woolen goods, machinery, railway cars, agricultural implements, stained glass, chocolate, and candles. There is a chamber of commerce and of agriculture, and the town has considerable trade in cattle, poultry, eggs, fruit, grain, and wine. Pop. (commune), 1901, 63,272; 1911, 69,361. It is the headquarters of the Fourth Army Corps.

Le Mans existed before the Roman conquest. Its original name was Vindinum. It was the chief city of the Cenomani, from whom it received its present name. It was fortified by the Romans in the second century, and became one of the most important cities of the Frankish Kingdom. It was taken by William the Conqueror in 1063 and suffered many sieges during the long Anglo-French wars. The Vendeans were defeated here in December, 1793, and the city subjected to a massacre. In 1871 it was the scene of the defeat of Chanzy's army by the Germans under Prince Frederick Charles, in a battle lasting from the 10th to the 17th of January. It is the birthplace of Henry II, Duke of Normandy and afterward King of England.

MANSARD (män′särd) **ROOF.** A form of roof named after N. François Mansart (q.v.). It is constructed with a break in the slope of the roof, so that each side has two planes, the lower being steeper than the upper. This kind of roof has the advantage over the common single-slant form of giving more space in the roof for living room.

MANSART, mäN′sär′, Jules Hardouin (1646–1708). A French architect, born in Paris, grandnephew of N. François Mansart, whose name he assumed in addition to his own family surname Hardouin. His father was peintre ordinaire du roi. He studied under his granduncle and under Bruant. The latter presented him to Louis XIV, to whose order he built the Château de Clagny for Madame de Montespan (1672). In 1675 he was admitted to the Académie d'Architecture, and from that time on, as architect of the King and contrôleur-général des bâtiments, he was occupied mainly with his two most important works, the dome of the Invalides (q.v.) and the palace at Versailles. The latter was almost wholly his design, though the core of the central block was the work of Levau under Louis XIII and the chapel was completed by De Cotte after Mansart's death. The Grand Trianon, the Château de Marly, and the Place Vendôme at Paris (but not its column) were also his work. The triple-shelled dome of the Invalides was completed from his design in 1735; it is regarded as his greatest and most original achievement.

MANSART, Nicolas François (1598–1666). A French architect, born in Paris, the son of a carpenter. Besides earlier works of less importance, he designed the extension of the Hôtel Carnavalet (1634); the Hôtel de la Vrillière (now the Banque de France) in 1635; the west wing (wing of Gaston d'Orléans) of the château of Blois (1635), and after 1645 the church of the Val-de-Grâce for Anne of Austria and the beautiful château of Maisons-sur-Seine for Louis XIV. Owing to his unreasoning extravagance in construction he was not permitted to complete the Val-de-Grâce, which was turned over to Jacques Lemercier (q.v.) for completion; but he erected a reduced replica of his design as a chapel for the Château de Fresnes. His work is noted for its classical refinement and purity of detail. His treatment of high roof stories gave rise to the term "Mansard roof" (*toiture à la Mansarde*). The spelling Mansard is not a correct form of the name.

MANSE. In Scots law, the dwelling house of a minister of the Established church. Every minister of a rural parish is entitled to a manse, which the heritors, or landed proprietors, are bound to build and maintain; and he is also entitled, as part of the manse, to a stable, cow house, and garden. The manse must, by statute, be near to the church. The amount fixed by law as the allowance for the manse has varied from time to time, and it may vary more or less according to circumstances, but it is now usually fixed at a value of £1000. It is only the ministers of rural parishes that are entitled to manses, and not ministers of royal burghs, where there is no landward district.

MAN'SEL, Henry Longueville (1820–71). An English metaphysician, born at Cosgrove, Northamptonshire. He graduated at St. John's College, Oxford, in 1843, and in 1855 was appointed reader in moral and metaphysical philosophy in Magdalen College. At Oxford he became Waynflete professor in 1859 and in 1867 professor of ecclesiastical history. In 1869 he was appointed dean of St. Paul's Cathedral, London. He belonged to the school of Sir W. Hamilton, whose lectures he edited (1859) with the assistance of Professor John Veitch. He was well versed in metaphysical philosophy and wrote in a clear and finished style. The best known of his publications is his *Bampton Lectures* (1858–59; 5th ed., 1867) on "The Limits of Religious Thought," in which, applying the idea developed in Hamilton's articles, "The Philosophy of the Unconditioned," he maintained that any attempt to arrive at an idea of the Absolute through the categories of substance or cause is attended by insurmountable difficulties. It was urged by many that the work, though purporting to be theistic, was really agnostic, and Spencer asserted (in the prospectus to his *Synthetic Philosophy*, 1860) that he was merely working out "the doctrine put into shape by Hamilton and Mansel." Controversies resulted between Mansel and F. D. Maurice and Goldwin Smith, and Mansel characterized his opponents' statements as misrepresentations. His further works include: *Prolegomena Logica: An Inquiry into the Psychological Character of Logical Processes* (1851; 2d ed., 1862); *The Philosophy of the Conditioned* (1866); *Letters, Lectures, and Reviews* (1873); *The Gnostic Heresies of the First and Second Centuries* (1875; ed. by J. B. Lightfoot, with biographical sketch by Lord Carnarvon). Consult the sketch referred to; also J. W. Burgon, *Lives of Twelve Good Men* (London, 1888), and A. W. Benn, *History of Rationalism* (ib., 1906).

MANSFELD, mäns'fĕlt, Ernst, Count (1580–1626). A German soldier, born in Luxemburg. He was the illegitimate son of Peter Ernst, Count of Mansfeld, and was educated by his godfather, Archduke Ernst of Austria. In return for valuable military services under his half brother in Austria he was legitimized by Rudolph II. The title and estates of his father were, however, withheld from him, and in revenge he joined the enemies of Austria in the Thirty Years' War as a stanch Protestant champion. He fought gallantly in Bohemia and on the Rhine for the Elector Palatine. His efforts failed, but brought him great renown. In 1625, under the leadership of Christian IV of Denmark and aided by English and French subsidies, he again attacked Austria. Wallenstein met and overcame his force at Dessau, April, 1626. But Mansfeld soon gathered a new army of 12,000 men and marched, in the summer of the same year, through Moravia and Hungary to join the forces of Bethlen-Gábor (q.v.) of Transylvania. When the latter made peace with the Emperor, Mansfeld tried to escape to Venice, but died on the way, in Rakowitza, near Serajevo, before the close of the year. Consult: Reuss, *Graf Ernst von Mansfeld in böhmischen Krieg, 1618–21* (Brunswick, 1865); Villermont, *Ernest de Mansfeld* (Brussels, 1866); Grossmann, *Des Grafen Ernst von Mansfeld letzte Pläne und Taten* (Breslau, 1876).

MANSFIELD, mänz'fēld. A market town and municipal borough in Nottinghamshire, England, 16 miles north of Nottingham, surrounded by the remains of the ancient forest of Sherwood (Map: England, E 3). The town is regularly built and has an early Norman church, a grammar school founded in 1561, 12 almshouses founded in 1693, and other charitable institutions. Its public buildings include a town hall and municipal offices, a mechanics' institute, free library and isolation hospital, and it owns water, gas, markets, bath, and pleasure grounds. It stands in the centre of a large manufacturing and coal-mining district. It manufactures shoes, machinery, lace, silk and cotton goods, and brick and tile. It is an important centre for cattle and agricultural produce. Many relics excavated in the vicinity point out that Mansfield was the site of a Roman station. Pop., 1901, 21,400; 1911, 36,888.

MANSFIELD. A town in Bristol Co., Mass., 24 miles south by west of Boston, on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 4). Noteworthy features include the Memorial Library, the town hall, and the high school. Among the products manufactured are machinists' tools, chocolate and cocoa, straw and felt hats, and baskets. The municipality owns a fine water-supply system and the electric-light plant. Pop., 1900, 4006; 1910, 5183.

MANSFIELD. A city and the county seat of Richland Co., Ohio, 79 miles southwest of Cleveland, on the Baltimore and Ohio, the Erie, and the Pennsylvania railroads, and interurban lines connecting with points on the Big Four System (Map: Ohio, E 4). It is on the Lincoln highway, at an elevation of 1487 feet, and has the Ohio State Reformatory, a memorial soldiers' and sailors' building, a public library, Sherman-Heineman Park of 100 acres, and two smaller parks. The city is an important trade centre

for the adjacent agricultural country, and is noted for the diversity of its manufactures, which include threshing machines, farm tractors and small farm implements, boilers, engines, engine fittings and brass goods, stoves, pumps, interior sanitary appliances, chains, brick, automobile tires, steel sheets, buggies, cigars, webbing and suspenders, electrical and electric-railway supplies, etc. Mansfield is governed under the Ohio municipal code, which provides for a mayor, elected biennially, a city council, and administrative boards of public safety and of public service. The water works are owned and operated by the municipality; also a large sewage and garbage disposal plant. Settled in 1808, Mansfield was first incorporated in 1828. It was the home of John Sherman (q.v.). Pop., 1900, 17,640; 1910, 20,768; 1914, 22,100; 1920, 27,824.

MANSFIELD. A borough in Tioga Co., Pa., 36 miles southwest of Elmira, N. Y., on the Tioga River and on the Erie Railroad (Map: Pennsylvania, G 2). It is the seat of a State normal school with a library of nearly 6000 volumes, and has a Carnegie library. The annual county fair is held here in beautiful Smythe Park. Mansfield is a shipping point for hay, cattle, and dairy products, stock and farm produce, and there are manufactures of condensed milk and wood novelties. Pop., 1900, 1847; 1910, 1654.

MANSFIELD, Mount. The highest peak of the Green Mountains in the State of Vermont, situated in the northwestern part of the State, 20 miles east by north of Burlington (Map: Vermont, C 3). It rises 3000 feet above the surrounding country and has three peaks, the highest of which is 4364 feet above sea level. Its summit affords one of the finest views in New England, including Lake Champlain with the Adirondacks beyond, and a large part of the Green and White mountains.

MANSFIELD, Edward Deering (1801–80). An American author, born in New Haven, Conn. He graduated at West Point in 1818, but declined to enter the army and studied at Princeton, from which he graduated in 1822. In 1825 he was admitted to the Connecticut bar. He afterward removed to Cincinnati, and in 1836 became professor of constitutional law in Cincinnati College. Shortly afterward, however, he abandoned the legal profession to engage in journalism, and edited successively the Cincinnati *Chronicle* (1836–49), *Atlas* (1849–52), and *Railroad Record* (1854–72). While editing the *Chronicle* and *Atlas* he introduced many young writers to the public, among whom was Harriet Beecher Stowe. He was Commissioner of Statistics for the State of Ohio from 1859 to 1868, was a member of the Société Française de Statistique Universelle, and published: *Political Grammar of the United States* (1835); *Life of Gen. Winfield Scott* (1848); *History of the Mexican War* (1849); *American Education* (1851); *Memoirs of Daniel Drake* (1855); *A Popular Life of Ulysses S. Grant* (1868); *Personal Memories* (1870), an interesting social and political chronicle reaching to the year 1841.

MANSFIELD, Joseph King Fenno (1803–62). An American soldier. He was born in New Haven, Conn., graduated second in his class at West Point in 1822, was assigned to the Engineer Corps as brevet second lieutenant, and during the next 24 years was engaged almost continuously on engineering work for the government, his most important service being the construction of Fort Pulaski, for the defense of Savannah River, Ga., to which he devoted most of his time between 1830 and 1846. During the Mexican War he served throughout the northern campaign as chief engineer under General Taylor, with the rank of captain, constructing and aiding in the defense of Fort Brown, taking a prominent part in the battle of Monterey (where he was wounded) and in the battle of Buena Vista, and receiving the successive brevets of major, lieutenant colonel, and colonel. He then served as a member of the Board of Engineers for the Atlantic coast defense from March, 1848, to April, 1853, and of the board for the Pacific coast defenses from April to May, 1853, and from 1853 to April, 1861, was inspector general of the United States army with the rank of colonel. During the Civil War he was engaged in organizing companies of volunteers at Columbus, Ohio, in April, 1861; commanded the Department of Washington from April to July, 1861; was appointed brigadier general of volunteers in May; was in command of the city of Washington from July to October; then commanded successively at Camp Hamilton, Newport News, and Suffolk, Va.; captured Norfolk, Va., on May 10, 1862; was raised to the rank of major general of volunteers in July; commanded a division in the Army of the Potomac during the Maryland campaign, and was mortally wounded at Antietam on Sept. 17, 1862.

MANSFIELD, Richard (1857–1907). An American actor, born May 24, 1857, on the island of Helgoland, where his parents — Madame Rudersdorff (Mansfield), a prima donna, and Maurice Mansfield, a London wine merchant —were staying. He made his first appearance as an actor while at school in England, playing Shylock at a class-day exhibition. His mother wished him to become an artist, and after leaving school he studied painting at South Kensington; but at the age of 17 financial difficulties forced him to seek a surer means of support, and he came to America, where he obtained a position as clerk in a mercantile house in Boston. In 1875 he returned to England, hoping to sell some pictures he had painted in the intervals of his clerical work. Failing in this, he accepted an engagement with a company of strolling actors, and sang in Gilbert and Sullivan operas. He continued to act in England till 1878, when he returned to America and appeared, September 26, in the opera *Les manteaux noires*. In January, 1883, he won success as Baron Chevrial in *A Parisian Romance*. This was followed by a number of rôles which within 10 years gained him a leading place among American actors. Among his parts were Dr. Jekyll and Mr. Hyde (1887); Richard III, produced in London in 1889; Beau Brummell (1890); Arthur Dimmesdale in his own dramatization of *The Scarlet Letter* (1892); Shylock (1893); Bluntschli in *Arms and the Man* (1894); Dick Dudgeon in *The Devil's Disciple* (1897); Cyrano de Bergerac (1898); Henry V (1900); Monsieur Beaucaire (1901); Brutus in *Julius Cæsar* (1902); Prince Heinrich in *Old Heidelberg* (1903); and the leading parts in *Ivan the Terrible* (1904), *Don Carlos* (1905), Molière's *Misanthrope* (1905), and Ibsen's *Peer Gynt* (1906). Deep study and careful elaboration of detail characterized Mansfield's work.

Bibliography. McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896); L. C. Strang, *Famous Actors of To-Day in America* (Boston, 1900); N. Hapgood, *The Stage in*

America in 1897–1900 (New York, 1901); P. Wilstach, *Richard Mansfield* (ib., 1908); W. Winter, *Life and Art of Richard Mansfield, with Selections from his Letters* (2 vols., ib., 1910).

MANSFIELD, William Murray, first Earl of (1705–93). A celebrated British jurist. He was born at Scone in Perthshire, Scotland, March 2, 1705, the fourth son of David, Viscount Stormont. He studied at Christ Church, Oxford, took the degree of M.A. in 1730, and was called to the bar in the same year. Through the facility and force of his oratory, as well as through the clearness of his understanding, he acquired a brilliant reputation and an extensive practice; in cases of appeal he was often employed before the House of Lords. In 1741 he was appointed by the ministry Solicitor-General, entered the House of Commons as member for Boroughbridge, and at once took a high position. In 1746 he acted, ex officio, as counsel against the rebel lords Lovat, Balmerino, and Kilmarnock; and in 1754 he was appointed King's Attorney. He became Chief Justice of the King's Bench in 1756. At this time he entered the House of Lords under the title of Baron Mansfield of Mansfield in the County of Nottingham. As his opinions were not those of the popular side, he was exposed to much abuse and party hatred. Junius, among others, bitterly attacked him; and in the Gordon riots of 1780 his house, with all his valuable books and manuscripts, was burned. He declined with dignity indemnification by Parliament. In 1776 he was made Earl of Mansfield. He worked hard as a judge till 1788, when age and ill health forced him to resign. His death occurred on March 20, 1793. He was a brilliant parliamentary debater, fluent, clear, and logical, and one of the greatest who ever sat on the bench. Consult: *Report of Cases Argued and Adjudged in the Court of the King's Bench during the Time of Lord Mansfield's Presiaency in that Court* (Dublin, 1794); John Holliday, *Life of William, Late Earl of Mansfield* (London, 1797); *A General View of the Decisions of Lord Mansfield* (ed. by Evans, ib., 1803); J. M. Rigg, in *Dictionary of National Biography*, vol. xxxix (ib., 1894).

MANSFIELD COLLEGE. A theological college at Oxford, England, not incorporated with the university. It was founded in 1886 by the transfer to Oxford of Spring Hill College, Birmingham, and has been erected and supported by the Congregational churches for the study of theology, particularly for the education of Congregational ministers. The buildings consist of an open quadrangle with hall, common rooms, library, lecture rooms, and chapel, and are well designed in Gothic style. Consult W. B. Selbie, "Founding of Mansfield College," in his *Life of Andrew Martin Fairbairn* (New York, 1914).

MANSI, män'sē, Giovanni Domenico (1692–1769). Roman Catholic Archbishop of Lucca. He was born at Lucca, Feb. 16, 1692; taught theology many years at Naples; made literary journeys through Italy, France, and Germany; established an academy in Lucca over which he presided; was made Archbishop in 1765; and died in Lucca, Sept. 27, 1769. He is best known as the editor of the great work on the councils, *Sacrorum Conciliorum Nova et Amplissima Collectio* (31 vols., Florence, 1759 et seq.), which goes down to the middle of the fifteenth century. Consult his *Life* by Zatta (Venice, 1772) and Quintin, *J. D. Mansi et les grand collections conciliaires* (Paris, 1900).

MANSION, mäN'syôN', Paul (1844–). A Belgian mathematician, born in Marchin-le-Huy. He became professor of mathematics in the scientific faculty in the University of Ghent, resigning in 1910. In 1877, with Namur, he published valuable logarithmic tables. His important works on analytical geometry, calculus, etc., include: *Théorie de la multiplication et de la transformation des fonctions elliptiques* (1870); *Théorie des équations aux dérivées partielles du premier ordre* (1875); *Résumé du cours d'analyse infinitésimale, etc.* (1887); *Principes fondamentaux de la géométrie, etc.* (1895); *Mélanges mathématiques* (1874–82, 1883–98); *Introduction à la théorie des determinants, etc.* (1877; 3d ed., 1899); *Calcul des probabilités* (1906); *Sur la portée objective du calcul des probabilités* (1908). He also translated from the German into French, among such translations being *La divine comédie de Dante* (1887) by Hettinger.

MANSION HOUSE. The name given to the official residence of the Lord Mayor of London, situated opposite the Royal Exchange. It was built between 1739 and 1753 from designs by George Dance, and its hexastyle Corinthian portico is a notable example of the classic revival under George II. State banquets are given in its Egyptian Hall.

MAN'SLAUGH'TER. The unlawful killing of another without malice, express or implied. It is this absence of malice which distinguishes the act from murder. Not infrequently persons are charged with this crime who are admittedly free from any moral blame. At common law manslaughter is of two kinds, voluntary and involuntary. The former includes cases of intentional killing, upon sudden heat or passion due to provocation, which palliates the offense; as when the person killed grossly insults or wrongs the slayer or quarrels with him. *Involuntary manslaughter* occurs when the killing is not intended, but results from the commission of an unlawful act which falls below the grade of felony, or from the doing of a lawful act in an unlawful manner, as in cases of culpable negligence. A railroad engineer, a trolley-car motorman, or a horse-car driver, whose negligent misconduct causes the death of a human being is guilty of manslaughter. By modern statutes the offense has been extended to every kind of homicide which on the one hand is not murder and on the other is not justifiable or excusable. It has also been divided into degrees—the first degree including cases marked by unusual cruelty, or by unlawful conduct of a grave character, such as a deliberate assault or the use of dangerous weapons, or administering drugs to produce miscarriage; while the second degree embraces culpable acts and omissions which are less blameworthy. The common law treated manslaughter as a felony, but within the benefit of clergy. Modern statutes in England punish the more serious forms by penal servitude for life and the lighter forms by imprisonment or fine. In the United States manslaughter in the first degree is punishable by imprisonment for a term generally varying from five to 20 years; in the second degree, by imprisonment for a shorter term, or by a fine of a limited amount, or by both fine and imprisonment. See Criminal Law (consult the authorities there cited); Homicide; Murder.

MANSO, män'sô, Johann Kaspar Friedrich (1760–1826). A German philologist and historian, born at Blasienzell (Gotha). He studied at Jena and from 1790 until his death was rector

of an academy at Breslau. As a poet, he was a dry didactic and was ridiculed by Goethe and Schiller in their "Xenien." His translations from the classics—Vergil's *Georgics* (1783) and the *Œdipus Rex* of Sophocles (1785)—were not successful, but the *Geschichte des preussischen Staates bis zur zweiten pariser Abkunft* (3 vols., 1819–20) has more merit and was much read. Consult *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884).

MANSON, George (1850–76). A Scottish water-color painter and engraver, born in Edinburgh. He at first worked as an engraver, and during this time and afterward studied painting in the Edinburgh School of Art, and etching in 1875, under Cadart in Paris. His pictures are usually of homely rustic subjects, treated with much delicacy and beauty of color and form; such are "Devotion," "What is it?" and "Milking Time." He was fond of painting children. As an engraver, Manson imitated the simple, direct methods of the Bewicks. Consult Gray, *George Manson and his Works* (Edinburgh, 1880).

MANSON, Sir Patrick (1844–1922). An English physician and parasitologist and writer on tropical diseases. He was born in Aberdeen, was educated there and in London, and first became known by his investigations into the pathology of filarial diseases. He was one of the first to suggest the hypothesis that the mosquito is an active agent in the propagation of malaria. He was dean of the College of Medicine for Chinese at Hongkong and for some years after 1897 was medical adviser to the British Colonial Office. He received many honors, including the K. C. M. G. in 1903 and the G. C. M. G. in 1912. In 1904 he investigated cachexial fevers, including kala azar (q.v.). Manson lectured on tropical medicine at the London School of Tropical Medicine and at the Charing Cross Hospital and Medical School, and was consulting physician to the British Seamen's Hospital. He published many monographs on tropical diseases. His most important works are *Filaria Sanguinis Hominis* (London, 1883) and *Tropical Diseases* (1898; 5th ed., rev., 1914). See Insects, Propagation of Disease by.

MANSURAH, mȧn-sōō′rȧ. A town of Lower Egypt, capital of the Province of Dakahlieh, situated on the right bank of the Damietta arm of the Nile, about 35 miles southwest of Damietta, on the Cairo-Damietta Railway (Map: Egypt, C 1). It has extensive cotton manufactures and carries on a large trade in raw cotton. The town was founded in 1222 and is noted as the place where Louis IX of France was defeated and made prisoner in 1250. Pop., 1907, 40,279.

MANT, Richard (1776–1848). An Irish bishop. He was born at Southampton, England; was educated at Winchester School and Trinity College, Oxford, taking his bachelor's degree in 1797; was elected fellow of Oriel College in 1798; was ordained priest in 1803; and was curate and vicar of several parishes in and near London, 1804–20. He was made Bishop of Killaloe and Kilfenoragh, Ireland, in 1820, and in 1823 was transferred to the see of Down and Connor, to which Dromore was added in 1842. Bishop Mant voted against Catholic emancipation in 1821 and 1825. In 1830 he was a member of the Royal Commission to inquire into ecclesiastical union. He was a prolific writer of poetry, as well as of historical and theological works; and some 20 of his hymns are found in many hymnals. With George D'Oyly (q.v.) he prepared the annotated edition of the Bible known as D'Oyly and Mant's Bible (1814), which had an immense sale in England and was republished in New York, with additions by Bishop Hobart. He also published *The Book of Common Prayer with Notes* (1820) and a *History of the Church of Ireland from the Reformation to the Union of the Churches of England and Ireland in 1801* (1840). His poetical works include a version of the Psalms (1824) and *Ancient Hymns from the Roman Breviary, with Original Hymns* (1837). Consult the memoir by his son, Walter Bishop Mant (Dublin, 1857).

MANTA, mȧn′tȧ. A port of the Province of Manabi, Ecuador, situated on the Pacific coast, 150 miles west-southwest of Quito (Map: Ecuador, A 4). Its harbor is deep enough for large vessels. Among the ports of the country in 1911 it held second rank in imports and third in exports, the former having a value of $22,629 and the latter $25,734. It exports straw hats, rubber, and coffee, and is the seat of a United States consular agent. Manta is the chief port of the province, serving especially the inland towns of Monticristi and Portoviejo. It was founded in 1535. Pop. (est.), 2500.

MANTA (Sp., blanket). A name about Panama of the huge ray (*Manta birostris*), more commonly known as devilfish (q.v.) or sea devil, which is greatly dreaded by the pearl fishers, "whom it is said to devour after enveloping them in its vast wings," sometimes 20 feet across, as in a blanket. See Plate of Rays and Skates.

MANTARO, mȧn-tä′rō. A river in Peru. It is formed at a height of 13,000 feet above sea level by the small head streams of Lake Chinchaycocha, in the western part of the Province of Junin. Thence it flows southeast past the towns of Jauja and Huancayo into the Province of Huancavelica, where it turns northeast, breaks through a deep gap in the eastern cordilleras, and joins the Apurimac to form the Ené, which joins the Quillabamba to form the Ucayalli. Its length is about 280 miles, and it is navigable a few miles above the junction.

MANTCHURIA, mȧn-chōō′rī-ȧ. See Manchuria.

MANTEGAZZA, mȧn′tȧ-gä′tsȧ, Paolo (1831–1910). An Italian physiologist and anthropologist, born at Monza. After studying medicine in the universities of Pisa and Milan, he received his doctor's degree at Pavia (1854), and then traveled extensively in Europe, India, and South America, where he practiced for a time in Paraguay and the Argentine Republic. In 1858 he returned to Milan, was appointed physician at the hospital in that city the following year, and became in 1860 professor of general pathology at Pavia. In 1870 he was made professor of anthropology at the Istituto di Studii Superiori in Florence, and there he founded the Museum of Anthropology and of Ethnology, the first in Italy, as well as the Italian Anthropological Society and a review, *Archivo d' Antropologia e d' Etnologia*. He was deputy for Monza in the Italian Parliament from 1865 until 1876, when he was appointed to the Senate. He was a prolific writer. His philosophical and medical works include: *La scienza e l' arte di guarire* (1859); *La generazione spontanea* (1864); *Elementi d' igiene* (1875); *Igiene dell' amore* (1878); *Fisiologia del dolore* (1880); *Fisiologia del piacere* (1881); *Fisonomia e mimica*

(1883); *Gli amori degli uomini: Saggio di una etnologia dell' amore* (1886); *Le estasi umane* (1887); *Fisiologia della donna* (1893); *Fisiologia dell' amore* (1896); *L' anno 3000* (1897); *L' amore* (1898). He also published travel sketches and political treatises: *Rio della Plata e Teneriffe* (1877); *Viaggio in Laponia* (1884); *India* (1884); *Studi sull' etnologia dell' India* (1886); *Ricordi d' un fantaccino al parlamento italiano* (1896); *Biblia della speranza* (1905); and among his novels may be mentioned *Il dio ignoto* (1876).

MANTEGNA, mân-tā′nyà, Andrea (1431–1506). An Italian painter and line engraver of the early Renaissance, the chief master of the Paduan school. He was born at Vicenza, the son of one Biagio (Blasius), who seems to have been a peasant. After the death of his father he removed to Padua, where he received his intellectual and artistic education. He was adopted by the painter Squarcione, whose apprentice and pupil he became. They disagreed repeatedly and finally separated, when Andrea came under the influence of Jacopo Bellini and espoused his daughter Nicolosia in 1453. It is the tendency of the latest criticism to minimize the influence of Squarcione upon Mantegna's art; nevertheless, it is certain that we find all the characteristics of Squarcione's school in it. He was also influenced by the work of Donatello and Pizzolo, his assistant, by Paolo Uccello, and by Fra Filippo Lippi at Padua. At the age of 17 Mantegna was an independent master, practicing his art at Padua, where he remained until the end of 1459.

The chief works of this early Paduan period are his seven mural paintings in the chapel of Sts. James and Christopher, in the church of the Eremitani, in which the entire progress of his art can be traced. Mantegna's paintings are far superior to those of the other pupils of Squarcione in the chapel and were as important for northern Italy as the Brancacci frescoes for Florence. Five are from the life of St. James and two from the life of St. Christopher. His earliest known work is a wall painting representing Sts. Bernardinus and Antonius (1452), above the main portal of San Antonio in Padua. Others are the fine polyptych of St. Luke in the Brera, Milan (1453–54), containing panels of saints in arched frames, the most prominent of whom is St. Luke; "St. Euphemia," in the Museum of Naples; the "Presentation of Christ in the Temple"; and the portrait of Cardinal Luigi Scarampi, in the Berlin Museum. The altarpiece of St. Zeno, Verona (1457–59), has rich classical decoration of columns and garlands; in the centre is the Madonna, surrounded by angels and by a group of saints on either side. The predella contained a "Crucifixion" of infinite pathos, now in the Louvre, which was flanked by "Gethsemane" and the "Resurrection," at present in the Museum of Tours.

In 1459, after repeated invitations from Lodovico Gonzaga, Marquis of Mantua, Mantegna removed to that city, where he resided for the remainder of his life. Here he participated in a sumptuous court life (designing pageants), decorated palaces, and painted portraits of his patrons. Although very independent and sometimes irritable, he was treated with high honor and great consideration by the Marquis and his successor, Francesco II, under whose patronage he continued until his death. He was granted a coat of arms, raised to knighthood, built himself an imposing dwelling, and gathered a fine collection of antiques. In 1483 Lorenzo de' Medici visited him, and in 1488 Pope Innocent VIII summoned him to Rome to decorate the Belvedere Chapel, now destroyed. In 1490 he returned to Mantua, where he died Sept. 13, 1506. His last years were darkened by financial troubles which caused the sale of some of his antiques, particularly a bust of Faustina to Isabella d' Este for 100 ducats. He left sufficient wealth, however, to provide for a fine family chapel in Sant' Andrea, in which he was interred. It contains a "Madonna with Saints" by his hand and frescoes after his designs by his two sons, Ludovico and Francesco, both mediocre painters.

His chief work at Mantua was the decoration of the Camera dei Sposi, the marriage chamber of Duke Gianfrancesco and Isabella d' Este, in the Castello di Corte, finished in 1474. Two of the walls and the ceiling remain. One of these, which is partially damaged, is covered with a realistic group of the Marquis, his wife, and the entire court. The other shows a meeting of the Marquis with Cardinal Francesco Gonzaga, both attended by relatives. The figures are nearly all in profile and stiff in action, but intensely realistic and of monumental grandeur. The same wall contains a hunting scene, somewhat damaged, and a group of beautiful genii holding an inscription. The ceiling is richly decorated and contains a circular dome painted to represent the open sky, with angels and other figures looking over a parapet. Before going to Rome, Mantegna had also begun his nine cartoons, the "Triumph of Cæsar," now in Hampton Court, which he finished soon after his return to Mantua. They are drawn on paper in high colors, to represent, as if in bas-relief, a continuous triumphal procession, and were used as hangings. No other monument of the fifteenth century shows such knowledge and feeling for the antique. For Isabella d' Este, Marchioness of Mantua, he painted two pictures in the famous chamber which she furnished with paintings by prominent Italian artists, viz., the "Triumph of Virtue over Vice" and "Parnassus," the latter containing groups of graceful classical figures in a romantic landscape. Both are now in the Louvre.

Among his other works painted at Mantua are a fine triptych in the Uffizi, with the "Adoration of the Kings," the "Circumcision," and the "Ascension"; "St. Sebastian," in the Gallery of Vienna; "St. George," in the Academy of Venice; "Summer," "Autumn," and the "Triumph of Scipio," in the National Gallery, London; and the "Dead Christ," in the Brera, Milan, a marvel of foreshortening and realistic ugliness. In later life he painted a large number of Madonnas, of which there are good examples in the Uffizi at Florence, the National Gallery, London, the Dresden Gallery, and the Trivulzio collection, Milan. Particularly famous is the "Madonna della Vittoria" (1496), painted in commemoration of a supposed victory over the French and now in the Louvre. Under a canopy of fruit and leaves the Virgin, surrounded by saints, is represented blessing Francesco Gonzaga. In the United States, Mantegna is represented in the Gardner collection, Boston, by the "Infancy of Jesus," an early work; in the Metropolitan Museum (Altman collection) by an admirable "Holy Family"; in the New York Historical Society by a "Crucifixion"; in the

Johnson collection, Philadelphia, by an "Adoration of the Magi"—the last three being late productions.

Reared in the classical atmosphere of Padua, whose university was the centre of classical learning, Mantegna was a highly cultured man, well versed in classical literature, and numbered among his friends prominent humanists, like Felice Feliciano, who dedicated a book to him. No other painter of the Renaissance understood antique art as did Mantegna. His paintings were its sculpture transferred to canvas, and he mastered completely its decoration. The figures and draperies are sharp and rigid, and his archæology is sometimes more learned than artistic. Yet he was a profound student of nature and an intense realist. His portraits are full of strength and character, his ideal figures noble and grand. No artist of the early Renaissance had greater invention and imagination. His execution was careful, his composition good, and the excellence of his drawing is attested by the finished drawings in the Louvre, British Museum, Uffizi, and other collections. As a colorist, he did not stand on the same high level, although his color, whether in bright or quiet harmonies, is at best very impressive. All of his work was in tempera, and his wall paintings, which were painted upon dry plaster, are improperly called frescoes. His influence on North Italian and Venetian painting was profound. He inspired Tura, and his works taught the later Venetians, above all Correggio.

Mantegna was the greatest line engraver of northern Italy, and his influence upon that art was potent not only in Italy, but in Germany as well. Unlike Italian engravers before him, he engraved copper plates from his own designs. At first his technique was primitive, but it improved with the study of German engravings. In all cases his invention is more interesting than his technique. The best-known plates of his Paduan period are the "Flagellation of Christ" and "Christ at the Gates of Hell"; to the Mantuan period belong the "Resurrection of Christ," "Deposition from the Cross," and "Entombment." This last plate had a greater influence upon art than any other ever executed. Its composition was adopted by Raphael in his picture of the same name, by Holbein (q.v.) in the "Basel Passion" series, and the figure of St. John was used by Dürer in his "Crucifixion." Mantegna also engraved a number of classical subjects, the best known of which are two Bacchanals, two "Battles of Tritons," and several plates from the "Triumph of Cæsar." He had a large number of followers who developed his technique and engraved his compositions, the best known of whom was Jacopo de' Barbari.

Bibliography. The sources for the life of Mantegna are chiefly his correspondence and other documents published by Baschet, "Documents sur Mantegna," in *Gazette des Beaux-Arts*, vol. xx (Paris, 1866), in the appendix to Kristeller's work, cited below. Vasari (q.v.) is unreliable upon Mantegna. The best modern authority is Paul Kristellèr, *Andrea Mantegna*, translated by S. A. Strong (London, 1901), containing a bibliography, a work as scholarly as it is critical. Among other monographs that by Maud Crutwell, *Andrea Mantegna*, in "Great Masters in Painting and Sculpture" (ib., 1901), is a good brief account, while Julia Cartwright, *Mantegna and Francia*, in the "Great Artists Series" (ib., 1881), is of a popular character. Other works on Mantegna are by Thode (Bielefeld, 1897); Yriarte (Paris, 1902); N. R. E. Bell, *Mantegna* (New York, 1911); also *Masters in Art*, vol. vi (Boston, 1905), containing an exhaustive bibliography; Fritz Knapp (ed.), "Andrea Mantegna," in *Des Meisters Gemälde und Kupferstiche*" (Stuttgart, 1910). For his engravings, see Hind, in the *Connoisseur*, vols. xv, xvi (London, 1906), and the volume of the "Great Engravers Series" entitled *Mantegna* (ib., 1910).

MANTELETTA, măn'te-lĕt'ä. See COSTUME, ECCLESIASTICAL, and Plate.

MANTEL, or **MANTELPIECE.** The decorative composition which forms a frame and setting for a fireplace. Its name is derived from the wide projecting hood (*manteau* = mantle) which in the later Middle Ages served to gather and convey to the chimney flue behind it the smoke of the fire on the hearth. When, first in France and later in England, the fireplace formed in the masonry of the wall itself or of a chimney breast took the place of the primitive fire on the open hearth, the hood lost its importance and the mantelpiece became one of the chief features of interior decorative architecture, employing sculpture as an adjunct to architecture with great effect. Famous Renaissance examples are in the Doge's Palace, Venice; the Musée Cluny, Paris; the Château of Blois; and others, especially of the Jacobean period, in English manor houses. In the eighteenth century a huge mirror in an ornate gilt frame became in France the universal and dominant feature of the mantelpiece above its shelf, while in England carved wooden mantelpieces, or designs of stone below, with woodwork above framing a picture or mirror, became common. The refined beauty of many American Colonial mantelpieces of painted woodwork is well known. Modern designers employ brick and terra cotta, as well as stone, marble, and wood, in mantelpieces of the greatest variety.

MAN'TELL, GIDEON ALGERNON (1790–1852). A British geologist, born at Lewes in Sussex. He studied and practiced medicine and surgery, in which he was successful, but devoted himself chiefly to geology and paleontology. His excellent collection of fossils was bought by the British Museum. He investigated the fossils of the Wealden formations and discovered four of the five genera of dinosaurs known at the time of his death. He was elected F.R.S. in 1825. He wrote a large number of books, memoirs, and papers, many of the papers being published in the *Philosophical Transactions* and the *Geological Transactions*. Among his books were *The Wonders of Geology* (1838) and *The Medals of Creation* (1844).

MANTELL, ROBERT BRUCE (1854–). An American actor, born at Irvine, Ayrshire, Scotland. His parents intended him for the law, but he made so little progress in his studies that they decided on a commercial career for him, and he was apprenticed to a wine merchant. During his apprenticeship he happened to take part in some amateur theatrical performances, and meeting with unexpected success, he developed a desire to become an actor. His parents opposed him in this, and at the age of 20 he left home and took passage for Boston. Failing to obtain an engagement there, he returned to England in two weeks, where he joined a company under the management of Richard Edgar and made his début Oct. 21, 1876, at Rochdale, Lan-

cashire, as the sergeant in *Arrah-na-Pogue*. His next important rôle was Father Doolan in *The Shaughran*. He then toured the provinces with Charles Matthews, Barry Sullivan, and Dion Boucicault till 1878, when he returned to America and played juvenile rôles in the company of Modjeska. His first appearance in London was in July, 1880, at Saddlers Wells Theatre. He visited America again in 1882, touring the country in *Romany Rye*, in which he appeared as Jack Hearn. In 1883 he played Boris Ispanoff in *Fédora* with Fanny Davenport. Later he became a star and appeared with his own company in a large repertoire of classic and romantic plays, including *Hamlet*, *Richard III*, *Othello*, *Macbeth*, *Romeo and Juliet*, *Corsican Brothers*, *Lady of Lyons*, and *Richelieu*. In later years he confined himself almost exclusively to Shakespearian rôles. He appeared in New York in revivals of *King Lear* and *Macbeth* in 1905 and in 1911, and in 1915, with his wife, had a successful season there in repertoire. William Winter (q.v.) paid high tribute to Mantell's ability. He came to be known for consistently sincere and intelligent work and for adequate productions.

MANTES, mänt. A town in the Department of Seine-et-Oise, France, beautifully situated on the left bank of the Seine, 30 miles west-northwest of Paris by rail (Map: France, N., G 4). A twelfth-century bridge crosses the Seine above the town, and modern bridges connect Mantes with an islet in the Seine and with Limay on the opposite river bank. The fine Gothic church of Notre Dame, dating from the twelfth century, occupies the site of the prior church burned during the siege of 1087; other buildings include the town hall, library, and palace of justice. Mantes has large tanneries, manufactures musical instruments and saltpetre, and has a considerable agricultural trade. Mantes was a Celtic town from which Julius Cæsar expelled the Druids; it is the Roman Medunta. William the Conqueror destroyed the town in 1087 and here received the injury which caused his death. Pop. (commune), 1901, 8034; 1911, 8821.

MANTEUFFEL, mänˈtoi-fel, Edwin Hans Karl, Baron von (1809–85). A Prussian general. He was born at Dresden, entered the army in 1827, and became an officer a year later. He became in 1843 the personal aid of Prince Albrecht and in 1848 of King Frederick William IV. His promotion was rapid, and he played a prominent rôle in the great Prussian military reforms. He was a lieutenant general in the War of 1864 against Denmark, and in 1865 became the Governor of Schleswig and as such played a prominent rôle in the ultimate solution of the Schleswig-Holstein question. During the War of 1866 against Austria he commanded the Army of the Main, and during the Franco-Prussian War he commanded the First Army Corps and participated in the battles of Colombey-Nouilly and Noisseville. Later he became the commander in chief of the German troops in south France and operated effectively there, driving Bourbaki's army across the Swiss frontier. After the close of the war he was made commander in chief of the German army of occupation and was decorated with the Iron Cross and the Black Eagle. In 1873 he was created field marshal and later sent on important diplomatic missions to Russia. His last prominent post was that of Governor of the Imperial Province of Alsace-Lorraine.

MANTEUFFEL, Otto Theodor, Baron von (1805–82). A German statesman, born at Lübben. He studied jurisprudence and political science at Halle and became in 1845–46 a director of one of the departments in the Prussian Ministry of the Interior. When Count Brandenburg undertook the suppression of the revolutionary movement of 1848, he was appointed Minister of the Interior. In 1850, at the death of Count Brandenburg, he took office as Minister of Foreign Affairs and president of the cabinet and as such pursued a reactionary policy. In 1856 he was sent as Plenipotentiary to the Congress of Paris and in 1858 retired from the ministry. After 1864 he was a member of the Prussian House of Lords. From his literary bequest H. von Poschinger published *Unter Friedrich Wilhelm IV. Denkwürdigkeiten des Ministers Otto Freiherrn von Manteuffel* (Berlin, 1901) and *Preussens auswärtige Politik, 1850–58* (ib., 1902). For his biography, consult Hesekiel (Berlin, 1851), and *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884).

MANTI, mänˈtī. A city and the county seat of Sanpete Co., Utah, 126 miles by rail south of Salt Lake City, on the Denver and Rio Grande Railroad (Map: Utah, C 3). The Mormon temple which cost about $2,500,000 is a noteworthy feature of the city, and there are two fine public school buildings, a public library, Manti Cañon, and municipally owned water works and electric-light plant. Manti is surrounded by a productive agricultural country, largely engaged also in sheep and cattle raising, and has flour mills, a candy factory, saw mills, stone quarries, and a creamery. In the vicinity are productive coal mines. Manti was settled in 1849 and incorporated two years later. The city was greatly damaged on several occasions by cañon floods, but by a system of patrol and regulation of various sections of the watershed this devastation has been stopped entirely. Pop., 1900, 2408; 1910, 2423.

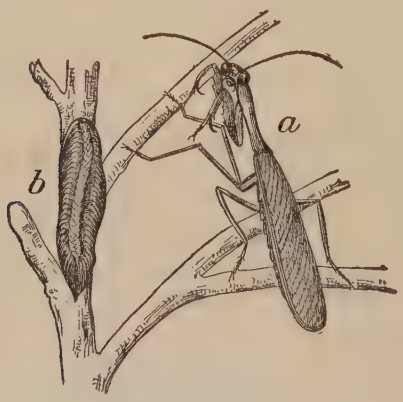
MANTINEA. See Mantineia.

MANˈTINEˈIA, or **MANTINEA** (Lat., from Gk. Μαντίνεια, *Mantineia*). A city of Arcadia, in the Peloponnesus, on the high table-land west of Argolis (Map: Greece, Ancient, C 3). It was on the river Ophis, in a broad plain, and was at first a group of open villages, owning the supremacy of Sparta. Shortly after the Persian wars, under Argive influence the five villages united in a fortified city, which gained great military strength. Through its efforts to control the watershed of the river Alpheus (q.v.) and the two highways which led from Arcadia to the Isthmus of Corinth, it frequently came into collision with Sparta; in these struggles the city sought help from Argos. Mantineia fought frequently with Tegea (q.v.). The community was dissolved later by the Spartans, in 385 B.C., only to be reconstituted by the Thebans under Epaminondas after the battle of Leuctra. The plain in which Mantineia stood, from its strategic importance, was the scene of several battles, of which the most famous was that of 362 B.C., when Epaminondas defeated the Spartans and Athenians, but fell himself in the moment of victory. Later, Mantineia became less important than Megalopolis (q.v.). For a time the city belonged to the Achæan League (see Achæa), but in 222, having deserted the League, it was laid waste. Excavations conducted by the French School at Athens during 1887 and 1888 have clearly determined the course of the walls of Mantineia and laid bare the Agora and its surrounding

buildings, including a small theatre, interesting because built up from the level plain instead of being laid, in the usual Greek fashion, against a hillside. The site of the city is now called Palæopoli. Consult: Fougères, *Bulletin de correspondance hellénique* (Paris, 1890); id., *Mantinée et l'Arcadie orientale* (ib., 1898); J. Kromayer, *Antike Schlachtfelder in Griechenland* (Berlin, 1903); D. Worenka, *Mantineia* (1905); Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

MANTIQUEIRA, män'tē-kā'ē-rä, Serra da. A mountain range in southeast Brazil. It extends for about 200 miles parallel with the Atlantic coast and about 70 miles away from it, first along the boundary between the states of São Paulo and Minas Geraes, and then for a short distance into the latter, where it divides into two branches, the Serra dos Aimores continuing along the coast, and the Serra do Espinhaço extending through the centre of Minas Geraes. The name Mantiqueira is sometimes applied to this whole system, but is properly confined to the single range in the south. It is granitic in character, and the highest and roughest in Brazil. Its highest point, Mount Itatiaia, on the state boundary, has an altitude of 9739 feet. The range is the watershed of the Rio Grande, the principal head stream of the Paraná.

MAN'TIS (Neo-Lat., from Gk. *μάντις*, diviner, prophet; so called from the position of the forelegs, which resembles the attitude of prayer). One of the popular names for any of the orthopterous insects of the family Mantidæ and the scientific name of the type genus. Other popular names are praying insect, soothsayer, prophet, rear-horse, mule killer. The family



THE REAR-HORSE.
a, adult male *Stagmomantis carolina*; *b*, egg case.

Mantidæ form the old group of the Orthoptera known as the Raptoria or graspers. They have the prothorax long and the front legs fitted for grasping their prey. The head is oblique and generally three-cornered. They are much more abundant in tropical regions than elsewhere and exhibit striking instances of protective resemblance and aggressive resemblance. The so-called "flower mantes" of tropical countries resemble the flowers of certain plants, and in these flowers they lurk awaiting the visits of the insects upon which they feed. The term "praying insects" has been derived from the attitude which they assume when at rest or when waiting to grasp another insect; the knees are bent and the front legs are held as though supporting a prayer book. The commonest North American species is the rear-horse or mule killer (*Stagmomantis carolina*), but the European (*Mantis religiosa*) has been introduced into the United States by accident and has become acclimatized. The eggs of the Mantidæ are laid in tough cases attached to the twigs of trees, where the young, when hatched, begin immediately to feed upon plant lice or other small soft-bodied insects, the size of the insects attacked increasing with the growth of the mantes. They have always been recognized as beneficial insects, but they are indiscriminate in their diet and will feed upon other beneficial insects as well as upon injurious forms. Their eggs are frequently parasitized by a very curious chalcis fly of the genus *Podagrion*, which by means of a long ovipositor is enabled to pierce the tough egg cases of the mantes.

These insects seem always to have been regarded with superstitious awe. They were used by the Greeks in soothsaying, and the Hindus display a reverential consideration of their movements and flight. In southern France the peasants believe that they point out a lost way; the Turks and other Moslems recognize intelligence and pious intentions in the actions of the mantis; a South African species is, or was, venerated by the Hottentots; the Chinese and the Javanese keep them in cages and cause them to fight for wagers.

MANTIS'SA. See Logarithms.

MANTIS SHRIMP, or Sea Mantis. A large burrowing crustacean (*Squilla empusa*), of the order Stomapoda, which lives in large irregular holes which it excavates at or near low-water mark of spring tides. It is so called from the resemblance of the great spiny claw to that of the mantis (q.v.). This claw is borne on the legs of the second pair, and instead of ending in a forceps-like claw, which is armed with a row of six sharp curved spines fitting into corresponding sockets, the terminal joint is turned back and is attached to the penultimate segment like the blade of a pocket knife to the handle. By means of these singular organs, says Verrill, the shrimps hold their prey securely and can give a severe wound to the human hand, if handled incautiously. It has large eyes, but, as it remains in its burrow constantly, it is blind, the facets of the eye being partly atrophied. It lives chiefly on annelid worms. The European species is used as food, and the American species is probably edible.

MAN'TLE (AS. *mæntel*, OF. *mantel*, Fr. *manteau*, It. *mantello*, Lat. *mantellum*). A long sleeveless cloak, worn in the Middle Ages over the armor and fastened by a fibula in front or at the right shoulder. The mantle was an important part of the official insignia of various orders of knighthood. Ladies wore mantles, often decorated with heraldic charges and bearing either the impaled arms of the lady and her husband or the husband's arms only. The Teutonic or White Knights were known as the *ordo alborum mantellorum* (order of white mantles) because of their white cloaks, and the robe of office worn by the electors of the Holy Roman Empire was called the electoral mantle. The name is still given to the robes of state of kings, peers, and knights.

MAN'TLING, Lambrequin, or Contoise. A heraldic ornament attached to the helmet. Sometimes it is cut into irregular strips and curls of the most capricious forms, supposed to indicate that it has been torn on the field of battle; but usually the strips fall in graceful,

flowing lines. In British heraldry the mantling of the sovereign is of gold lined with ermine; that of peers, ordinarily of crimson velvet lined with ermine; but sometimes the livery colors (see LIVERY) are adopted instead, as is generally the practice in continental heraldry. This kind of mantling, being inseparable from the helmet, cannot be used by ladies. See HERALDRY.

MANTRAS, män'tràz. A people of the territory of Malacca and Rembau, formerly regarded as a Negrito people of the Malay Peninsula, but more recently described as Sakai-Malay half-breeds. The mixture of these peoples has resulted in giving the Mantras a somewhat taller stature than the Sakai and a whiter skin.

MAN-TSE. See MANS.

MANTUA, män'tû-à (It. *Mantova*). A fortified city of Lombardy, Italy, situated on the Mincio, 25 miles by rail southwest of Verona and 100 miles southwest of Milan (Map: Italy, C 2). It was formerly the capital of the Duchy of Mantua and is now the capital of the province of the same name. It is the see of a bishop and the centre of a military district. It occupies two islands in the river and is elaborately fortified. Three lakes formed by the river half surround the town and there are marshes adjacent. It is not a healthful city. Architecturally it is interesting on account of the Renaissance churches and secular edifices, especially the church of Sant' Andrea, built towards the close of the fifteenth century after plans by Leon Battista Alberti (q.v.), also the chapel of San Sebastiano by Alberti. The old Ducal Palace, built 1302–28, is one of the largest of its kind in Europe. It is still more prominent in the world of painting, owing to the works of Mantegna and Giulio Romano, both of whom resided here. The inadequate population and the sullen massive grandeur of the edifices explain why the traveler in Mantua associates the city with a gloomy decadence. The streets are regular and spacious, but poorly paved. There are several fine squares. The spacious Sant' Andrea has been subjected to many changes during the centuries. Its white façade of marble is adorned with a portico and contrasts curiously with the adjacent red brick campanile. The interior (110 yards long) contains many frescoes by prominent artists. The cathedral of San Pietro is not attractive, but has a fine ceiling.

The Corte Reale, formerly the Ducal Palace of the Gonzagas and now consigned to military purposes, is a notable structure dating from the beginning of the fourteenth century. It was embellished with frescoes by Giulio Romano. Its apartments are of exceptional interest for their varied decorations, representing the most delightful Italian period of the art of interior ornamentation. Another fine old Mantuan palace is the Palazzo del Tè, constructed by Giulio Romano and adorned by him in a most artistic style. Some of the frescoes are excellent. The friezes in the loggia are by Primaticcio, who was educated in Mantua under Giulio Romano. In the old castle of the Gonzagas is a collection of archives. Among the frescoes here by Mantegna only two remain in a satisfactory condition. The Vergilian Academy of Arts and Sciences contains some specimens of art. The neighboring library in the Lyceum has a work by Rubens, who lived and studied in Mantua several years. In the adjacent museum are some good Greek busts and sarcophagi, and the Museo Partio possesses other antiquities. A statue of Dante and the house of Giulio Romano are shown as attractions to the visitor in Mantua. It was formerly an important military post, but owing to the swampy nature of the surrounding area was maintained with difficulty. The city has a theological institute, a botanical garden, an astronomical observatory, a public library with 75,000 volumes, founded in 1780 by Maria Theresa, and an excellent, commodious military hospital. The modern sections of the city have ironworks, oil and flour mills, tanneries, breweries, toy factories, etc. Pop. (commune), 1901, 29,142; 1911, 32,657.

History. Mantua was originally an Etruscan city. It became a Roman municipium just before the time of Vergil, who was born in the neighboring region of Andes, but very near to the town. In the sixth and seventh centuries the town was occupied by the Lombards. In the ninth century it was in the hands of the Church. The town rose to importance in the twelfth century, when it became one of the city republics and a member of the Lombard League. Towards the close of the thirteenth century began the rule of the house of Bonaccolsi, which was succeeded in 1328 by the house of Gonzaga. A century later Mantua with its territory was erected into a marquisate, and in 1530 the Gonzagas became dukes of Mantua. The state prospered greatly under this dynasty, its political power and territory being increased at the expense of Venice and Milan. The Gonzagas were liberal patrons of the arts and learning. After the Mantuan War of Succession (1628–30) the city began to decline. The last Duke was driven away in 1703 and died in 1708 and Mantua fell to Austria. The French took the city in 1797, but lost it again in 1799. The Treaty of Lunéville (1801) restored it to the French, who held it until 1814. The Austrians then held it until 1866, when it was ceded to Italy. During the Austrian occupation it was of great military importance and constituted one of the so-called quadrilateral of fortresses, the others being Verona, Legnago, and Peschiera. See GONZAGA, HOUSE OF.

MANTUAN (män'tû-*an*) **BARD, MANTUAN SWAN.** Titles applied to Vergil in allusion to his birthplace, Mantua.

MANU, mä'nōō (from Skt. *manu*, man). An ancient mythical sage of India, the progenitor of mankind, according to the Hindus, and the reputed author of the great law book known as the Code of Manu (Skt. *Mānava-Dharma-Sāstra*).

There is no good ground for accepting the existence of Manu as a historical personage. In the *Rig-Veda* he is merely the ancestor of the human race, the first one to offer a sacrifice to the gods. In the *Satapatha Brahmana* and in the *Mahābhārata* he alone survives the universal deluge. In the first chapter of the law book ascribed to him he declares himself to have been produced by Viraj, who was an offspring of the Supreme Being, and to have created all this universe. Hindu mythology knows, moreover, a succession of Manus, each of whom created, in his own period, the world anew after it had perished at the end of a mundane age.

The *Mānava-Dharma-Sāstra*, written in verse, is a collection of religious ordinances, customs, and traditions, such as would naturally grow up by established usage and receive divine sanction in course of time. This work is not a mere law book in the European sense of the word; it is

likewise a system of cosmogony; it propounds metaphysical doctrines, teaches the art of government, and treats of the state of the soul after death. In short, it is the religious, secular, and spiritual code of Brahmanism. It is divided into 12 books. The chief topics are the following: (1) creation; (2) education and the duties of a pupil, or the first order; (3) marriage and the duties of a householder, or the second order; (4) means of subsistence, and personal morality; (5) diet, purification, and the duties of women; (6) the duties of an anchorite and an ascetic, or the duties of the third and fourth orders; (7) government, and the duties of a king and the military caste; (8) judicature and law, private and criminal; (9) continuation of the former, and the duties of the commercial and servile castes; (10) mixed castes and the duties of the castes in time of distress; (11) penance and expiation; (12) transmigration and final beatitude.

This Code of Manu, not improbably based on a *Mānava Dharma Sûtra*, is closely connected with the *Mahābhārata* (q.v.), of which three books alone (iii, xii, xvi) contain as many as 260 of its 2684 slokas. It probably assumed its present form not much later than 200 A.D.

Bibliography. The text of Manu has often been edited and translated, as by Mandlik, with seven native commentaries (Bombay, 1886); Julius Jolly, *Mānava-Dharma-Sāstra* (London, 1887); in the series of the Nirnaya Sagara Press (Bombay, 1887); and better, with Kullūka's commentary (ib., 1888). There are several translations, especially by Bühler, *The Laws of Manu* (Oxford, 1886), and by Burnell and Hopkins, *The Ordinances of Manu* (London, 1884, 1891). Consult also: E. W. Hopkins, *Mutual Relations of the Four Castes According to the Mānavadharmaçāstram* (Leipzig, 1881); the French translation of Strehly (Paris, 1893); Beaman, *On the Sources of the Dharmaśāstras of Manu and Yājñavalkya* (Leipzig, 1895); Julius Jolly, *Recht und Sitte* (Strassburg, 1896); S. V. Ketkar, *History of Caste in India: Evidence of the Laws of Manu in the Social Conditions in India during the Third Century* (2 vols., Ithaca, N. Y., 1909–11); A. A. Macdonell, *History of Sanskrit Literature* (London, 1913).

MANUA (mȧ-nōō′ȧ) **ISLANDS.** See SAMOAN ISLANDS.

MAN′UAL (Lat. *manualis*, relating to the hand, from *manus*, hand). The keyboard of an organ played by the hands, in contradistinction to the pedal, played by the feet. The number of manuals varies from two to four according to the size of the organ. In older French organs even five manuals are found. The names of the different manuals are: (1) great organ; (2) choir manual; (3) swell manual; (4) solo manual; (5) echo manual. Each manual really is a separate organ in itself, having its own set of pipes and stops. By means of couplers any or all of the manuals can be connected, so that by striking a note on one manual the same note sounds on all the other manuals that are coupled. The usual compass of manuals is four octaves and a fifth, C-g^3.

MANUAL OF ARMS. The rules and explanations for the instruction of military recruits in the use of their arms and their care and preservation. They are part of the course of instruction given the soldier in the school of the soldier, which in turn is one of the several distinct courses of training included in the manual known as drill regulations (q.v.). The manual of arms owed much of its former elaborateness, both in the United States and England, to its German origin. In this connection it is interesting to note that the exercises in all three countries have been reduced in number and simplified. In the United States army all drills are prefaced and concluded with an examination of cartridge chambers, as a precaution against accidents, and for purposes of instruction the movements are divided into motions and executed in detail. The command of execution determines the prompt execution of the first motion, and the commands *Two*, *Three*, etc., the other motions. The commands and movements of the manual of arms are given after the soldier is in position with rifle at the *order*, and are as follows: (1) order arms; (2) present arms; (3) right shoulder arms; (4) port arms. Other movements are: (5) parade rest; (6) fix bayonets; (7) charge bayonets; (8) trail arms; (9) rifle salute; (10) inspection arms.

MANUAL TRAINING. This term, in spite of considerable criticism, has come to be generally applied to the use of constructive handwork in the schools, as a feature of general education. The term is broadly used to include the work of both boys and girls in various materials, in which case instruction in domestic arts and science is understood; but it is often used in a narrower sense as relating only to the work with tools commonly given to boys. The chief grounds of objection to the use of the term are that it emphasizes discipline rather than content. There is a tendency at present to use the term "handwork" or "handicrafts" for the actual constructive work and to introduce a new group of content subjects, which furnish information about industries in general, under the name of industrial arts. The two branches are intended to supplement each other, with the result that the type of constructive work is enriched and varied. The aim in general is not only to provide some acquaintance with industrial organization of the world, but also to afford boys and girls about to leave school some basis for selecting their future occupations. To this extent such courses are also prevocational.

The earliest official recognition of manual training as a legitimate part of school work was obtained in European countries. As early as 1858, Uno Cygnæus organized a plan of manual training for the primary schools of Finland, and in 1866 instruction in some branch of manual work was made compulsory in the training colleges for male teachers in that country and in all primary schools for boys in country districts. Sweden is, however, the country which contributed most towards the early development of manual training and from which has come the largest influence in its propagation. In 1872 the government reached the conclusion that schools for instruction in Sloyd were necessary to counteract the tendency towards concentration in cities and the decline of the old home industries. The schools first established had naturally an economic rather than an educational significance. This was changed, however, as the movement grew, until a thoroughly organized scheme of educational tool work for boys between 12 and 15 years of age was developed. In 1877 the work was introduced into the folk school, and the government granted aid in support of the instruction. The Sloyd Seminarium at Nääs, established in 1874 under the

direction of Otto Saloman, was not only an active and stimulating force in the development of the work in Sweden, but exercised a far-reaching influence upon the thought and practice of other countries. At present Sloyd is taught in all the regular normal schools of the country.

In France manual training was made obligatory in the elementary primary schools by the Law of 1882. The official programme for manual training is very complete and thorough, but its provisions are only partially realized because of the failure of communes to provide workshops and of the insufficient supply of trained teachers. In Paris about 200 schools were equipped with workshops in 1914, and at this time more than one-third of the regular teachers in the city schools had taken normal courses in manual training. A feature of the French work is the variety of materials and processes used and the fact that handwork instruction has been planned for every grade of the elementary primary school. The tendency here is to associate handwork with drawing and mathematics more closely than is done in other countries.

Germany, although the seat of a very active propaganda issuing from the German Association for Manual Training for Boys, has done very little towards incorporating manual training with the regular work of the common schools. A large number of workshops have been established in various parts of the Empire, supported mainly by individuals and societies, in which pupils of the public schools are given instruction out of school hours. The educational ministries of Prussia, Saxony, and Baden make annual contributions in aid of this instruction, but the work is obligatory in only a very few places. Manual work for girls, on the other hand, has been for a long time a compulsory branch of instruction in the common schools of Germany. The Manual Training Seminary at Leipzig, founded in 1887 by the Association for Manual Training for Boys, under the leadership of Dr. Waldemar Götze, is the active centre of the movement and the main institution for the training of teachers.

In England handwork received but little official encouragement until quite recently. It was taught here and there in elementary schools, but on no organized basis. The need of manual training was pointed out by the Royal Commission on Technical Education in 1882 and again in 1884, after it had met with success in Manchester and Sheffield. In 1890 it appeared in the code for elementary schools "as recognized for attendance purposes," and grants were paid for the subject by the Department of Science and Art from 1891 to 1898. The subject was taught and is still taught frequently in centres used by a number of schools; the instructors were often skilled craftsmen, but the tendency now is to give regular teachers training in handwork in special and summer courses. So far as aim is concerned, the movement has been from an emphasis on hand and eye training and the subject for its own sake to the present emphasis on handwork as a method of expression with possibilities of application to geography, nature study, history, arithmetic, and geometry. Handwork is now found generally in all classes of the elementary schools from the constructive work of the infant schools through the light woodwork in the middle stages to the manual training of the older pupils. The media used are clay, plasticine, paper, string, wire, cardboard, prepared wood, wood, and metal. In the secondary schools comparatively little attention has been given to manual training, which was for long regarded as an extra and was not infrequently taught by the school janitor or carpenter or any other person able to handle tools.

The history of manual training in the United States involves both the development of the idea and the development of practice. In the field of practice, little of a purely educational character appeared before 1878, at which time the Workingman's School was founded by the Ethical Culture Society of New York. This institution comprised a kindergarten and an elementary school, in which manual work formed from the first a vital and important part of the educational scheme. The general movement, however, took its large beginning, as has been the case with so many educational movements, at the top instead of the bottom of the school system. In 1880, through the efforts of Dr. Calvin A. Woodward, the St. Louis Manual Training School was opened in connection with Washington University. The work of this school attracted wide attention, and its success led to the speedy organization of similar schools in other large cities: Chicago, Baltimore, and Toledo, 1884; Philadelphia, 1885; Cleveland, Cincinnati, and Omaha, 1886. The first provision for girls' work in these schools was made in the case of the Toledo school and included sewing, dressmaking, millinery, and cooking. In 1895 the Massachusetts Legislature, under the lead of the State Board of Education, made it obligatory upon every city in the State of 30,000 or more inhabitants to establish and maintain manual training in a high school.

The rapid development of this type of secondary school resulted in the establishment of an institution peculiarly American. In other countries the introduction and spread of manual training has been confined to the elementary school, and no institution exists in Europe, of a purely educational character, that presents any parallel to the comprehensive and costly equipment of these schools. The shopwork comprised joinery, turning, pattern making, forging, and machine work, and sometimes foundry practice and tinsmithing. The nature of this work was very similar in the various schools, and until late years has been almost uniformly based upon the principles of the Russian System. The central idea of this system of shopwork instruction, developed in a technical school for the instruction of engineers, is the analysis of a craft into its elementary processes and constructions, and the presentation of these details in an orderly and sequential scheme as separate elements. This type of manual-training high school tended to become formal and scholastic and gradually lost its distinctive character. It has in recent years begun to be replaced by industrial or technical schools providing some definite vocational training, but the new type in turn is only in process of reorganization. In place of work that has been called "abstract, isolated, impractical, and unsocial in character," courses have been established in Cincinnati and Fitchburg which involve work under actual labor conditions, the students working for part time in school and part time in the shop. (See TECHNICAL EDUCATION.) Compared with the development of manual training in the high school, the introduction of the work in the public elementary school came at first but slowly. Experi-

mental classes in carpentry, the expense for which was borne by Mrs. Quincy A. Shaw, were conducted at the Dwight School in Boston in 1882. These were taken under the care of the city and transferred to temporary quarters in the English High School building in 1884, but the work did not receive a place in the course of study until 1888. In Springfield, Mass., sewing was introduced in the schools in 1884 and in 1886 a manual training school was established, at which pupils coming voluntarily from the elementary schools received instruction in knife work. In 1885 the Legislature of New Jersey passed a law providing that the State would duplicate any amount between $500 and $5000 raised by a city or town for instruction in manual training. This led to the early introduction of the work in a number of places in various parts of the State. In 1888 the city of New York began the introduction of a manual-training course of study, including drawing, sewing, cooking, and woodwork.

All this early work was crude and experimental, and it was not until the influence emanating from the Sloyd School of Boston began to be felt that tool work for boys in the elementary school took on a more definite character. A vital principle of the Sloyd work is the appeal to the interest of the worker through the construction of a finished object of definite use related, generally, to the needs of home life. This principle has gained general acceptance in the work of the elementary school and has to quite an extent modified the character of the work done in the high schools. From the upper grade of the grammar school with the provisions for shopwork for boys, and cooking and sewing for girls, handwork has made considerable progress in its way downward. Work in clay, paper, cardboard, sewing, weaving, basketry, bent iron, and simple wood construction are the processes most commonly employed. The aim has ceased to be one of purely disciplinary character; instead handwork is provided in the elementary schools to give practical expression and interpretation in concrete fashion to the bookwork of the classroom. Through it the pupil may be introduced to the social and industrial occupations of his environment; he may gain some idea of the development of industries or facility in giving concrete expression to an idea. As was mentioned earlier, the present phase aims to give a general acquaintance with the industrial organization of the world and to provide opportunities for selection of a vocation. At Gary, Ind., an experiment has been conducted which attracted considerable attention. Here, after the general preparatory handwork of the lower grades, the older pupils are given opportunities to learn and participate in those occupations necessary for equipping and repairing the school, which are going on all the year round. The pupils are practically apprentices to the expert workmen, who are selected for character, skill, intelligence, and teaching ability. In this way the pupils are trained not merely in exercises, but on genuine and real jobs, and come into contact with the work of carpenters, cabinetmakers, painters, plumbers, metal workers, engineers, electricians, printers, etc. In this way they may learn something about the different industries and try out their skill and inclinations in each until they are ready to select a vocation.

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MANU'CHE, or **MANUCCI,** mȧ-nōō'chē, Cosmo. An English dramatist, probably of the Florentine family of the Mannucci, originally. It appears that he was aided in his literary endeavors by James Compton, Earl of Northampton, of whose retinue he was a member. During the civil wars he was successively captain and major of infantry, and afterward he busied himself in the instructing of private pupils and the writing of plays. His poverty was somewhat relieved by application first to Cromwell and afterward to Charles II. Twelve plays, nine in manuscript and three printed, are generally ascribed to him. There is no evidence that any was presented. One, *The Just General* (1652), described as a "tragi-comedy," and considerable portions of others are written in a peculiar rhythmical blank verse, scarcely different from prose. Consult: Charles Lamb, *Specimens of the English Dramatic Poets* (London, 1808, and subsequent editions); F. G. Fleay, *A Biographical Chronicle of the English Drama, 1559–1642* (ib., 1891); Sidney Lee, in *Dictionary of National Biography,* first supplement, vol. iii (ib., 1901).

MAN'UCODE (Malay *Manukdevata,* bird of the gods). The name originally given to the king bird of paradise, but now applied to certain Papuan birds probably not relatives of the Paradiseidæ at all. They have glossy, steel-blue plumage and are remarkable for their vocal powers. Lesson, Forbes, and other ornithologists assert that they are able to pass through every note of the gamut. Eight or 10 species are known, of which *Manucodia viridis* is common throughout the entire Papuan region. It is described by Wallace as being powerful and active, clinging to the smaller branches of the trees on which it finds the fruit that constitutes its food. See Bird of Paradise.

MANUEL (măn'ū-ĕl) **I, COMNE'NUS** (c.1120–80). Byzantine Emperor from 1143 to 1180. He was the youngest son of the Emperor

John II, or Calo-Johannes, whom he succeeded upon the throne. He became at once involved in an uninterrupted series of wars in Asia and Europe. In 1144 Raymond, Prince of Antioch, who had thrown off the Byzantine yoke, was compelled to submit again to vassalage. In 1147 the Crusaders, under Louis VII of France and Conrad III of Germany, marched through Manuel's dominions without serious hindrance on his part, as he was at this time entangled in a war with Roger, King of Sicily. This conflict proved a long and arduous one. For a time the Byzantine arms were victorious, but the fortune of war changed and no substantial gain resulted. Manuel was engaged in protracted wars with the Seljuks, who in 1176 defeated his forces in a great battle at Myriocephalon. He aided the enemies of Frederick Barbarossa in Italy. He also waged war with the Hungarians and with the Venetians, being unsuccessful against the latter. He died Sept. 24, 1180. The reign of Manuel was one of great splendor, but the expenses of the numerous wars and his policy of allowing the Italians special privileges in trade sapped the strength of the Empire. Consult: G. L. F. Tafel, *Komnenen und Normannen* (2d ed., Stuttgart, 1870); George Finlay, *History of Greece*, vol. iii (London, 1877); Hans von Kap-Herr, *Abendländische Politik Kaiser Manuels* (Strassburg, 1881); Ferdinand Chalandon, *Les Comnènes*, vol. ii (Paris, 1912).

MANUEL II, PA'LÆOL'OGUS (c.1350–1425). Byzantine Emperor from 1391 to 1425. He succeeded his father, John V, as sole ruler after he had been an associate in the Empire since 1374. Fearing that Constantinople would fall into the hands of the Turks, Manuel applied for aid to the western princes, whose army was defeated with great slaughter by Bajazet (q.v.) at Nicopolis, in 1396. In 1398 a nephew of Manuel with the aid of Bajazet rose in rebellion, and the Emperor was compelled to make him co-Emperor. He was known as John VII. Manuel was in constant peril until Bajazet was defeated by Timur at Angora, in 1402, and taken prisoner. After the death of Bajazet in 1403 Manuel reigned in peace for 18 years, for the young Sultan Mohammed I was his intimate friend. But when in 1421 Mohammed died and Amurath II came to the throne, the old contest was renewed. In 1422 Constantinople was besieged, and although the siege failed, Manuel had to sign a humiliating treaty. He retired to a monastery in 1423, after a severe illness, his son John VIII becoming practically the sole ruler. Manuel died in 1425. He was the author of several theological treatises. Consult: Xivrey, "Sur la vie et les ouvrages de l'empereur Manuel Paléologue," in *Mémoires de l'Académie des Inscriptions*, vol. xix (Paris, 1853); Karl Krumbacher, *Geschichte der byzantinischer Litteratur* (2d ed., Munich, 1897); Edwin Pears, *Destruction of the Greek Empire* (London, 1903).

MANUEL I, THE FORTUNATE (1469–1521). A King of Portugal, in whose reign that country attained the highest pitch of power and splendor. He succeeded John II in 1495, ruled throughout with the help of the Cortes, and did much for art and letters by his generous patronage. The only blot on his domestic administration was his persecution of the Jews. And yet, as evidence that he had some liberal leanings even in religious matters, we have the fact that he secured from the Pope authorization for a decree granting the right to marry to members of Portugal's two most distinguished orders—the Knights of the Order of Christ and the Knights of the Order of Santiago. But the same militant Christianity led him to attempt conquests in Africa, in which he was unsuccessful, to enter into diplomatic relations with many far-off lands, and to fit out great expeditions of exploration and conquest. It was Manuel who sent Vasco da Gama around the Cape, Cabral upon the voyage which resulted in the accidental discovery of South America, Cortereal to North America, and Almeida and Albuquerque to the East Indies, where a wide field was opened for Portuguese commerce.

MANUEL II (1889–). King of Portugal in 1908–10. He was born in Lisbon two years after the Crown Prince Luis, and had the title of Duke of Beja. There were scandalous stories of his wild living in Paris, and he seemed little fitted for the throne to which he succeeded upon the assassination, on Feb. 1, 1908, of his father King Carlos I and of his brother Luis. He was acclaimed King and took the oath on May 6, 1908. When the Republicans, in October, 1910, overturned the Portuguese monarchy, Manuel escaped to England, taking refuge there at Twickenham with the Duke of Orléans, brother of Manuel's mother, Marie Amélie, who was daughter of the Comte de Paris. Royalist uprisings in Portugal in 1911 were unsuccessful. In 1912 Manuel and Dom Miguel apparently came to an understanding and joined forces for the reëstablishment of the kingdom. In September, 1913, Manuel married Princess Augustine Victoria of Hohenzollern-Sigmaringen.

MANUEL, má'nụ'ĕl', EUGÈNE (1823–1901). A French poet and prose writer, born in Paris of Jewish parents. From 1849 to 1871 he taught rhetoric in different Parisian lyceums. He was appointed chief of cabinet to the Minister of Public Instruction in 1871, a year later was made inspector of the Academy of Paris, and in 1878 inspector general. With his brother-in-law, E. Lévi-Alvarès, he published four volumes of lectures for the use of students, entitled *La France* (1854–55; 6th ed., 1868). Several of his verse collections were crowned by the Academy. They include: *Pages intimes* (3d ed., 1869); *Poèmes populaires* (1871); *Pendant la guerre* (1871); *Un voyage* (5th ed., 1890); *Poésies du foyer et de l'école* (16th ed., 1892). His play *Les ouvriers* (1870) also received academic honors, and Madame Sarah Bernhardt made her first appearance at the Comédie Française in his drama *L'Absent* (1873). Manuel edited the *Œuvres lyriques de Jean Baptiste Rousseau* (1852) and Chénier's *Poésies* (1884).

MANUEL, mä'nụ'âl', DON JUAN (1282–1349). A Spanish prince and author, born at Escalona. He was the nephew of Alfonso X, called "the Wise." His father died in his youth, and he was brought up by his cousin, Sancho IV, who was succeeded by Ferdinand IV. Upon his death Don Manuel was coregent for the young heir, Alfonso XI (1320). When the King was proclaimed of age (1325) he married Constanza, the daughter of Don Juan Manuel, appointed his father-in-law *adelantado mayor de la frontera*, and then repudiated Constanza, whom he imprisoned at Toro. This angered Don Juan Manuel, and from 1327 to 1335 there was active war between them, ending in the King's victory. He afterward received Don Juan Manuel into favor and made him general in chief of the army against the Moors. Don Juan Manuel is

better remembered now as author than as soldier, and despite the turbulence of his life he was a voluminous writer. His prose is clear, vigorous, and interesting. Several of his works may be found in Rivadeneyra's *Biblioteca de autores españoles*, vol. li (Madrid, 1884). The most important of them is *El Conde Lucanor*, first published, and with a commentary, by Gonzalo Argote de Molina in 1575. This consists of 49 stories, told somewhat in the Oriental manner, with a little moral in verse at the end of each tale. More modern editions of *El Conde Lucanor* are those of Stuttgart (1839), Barcelona (1853), Madrid (1860), Vigo (1898 and 1902), and Leipzig (1900). There is an English translation by James York (London, 1868 and 1888). For editions of his other works, and for studies about him and his works, consult James Fitzmaurice-Kelly, *Bibliographie de l'histoire de la littérature espagnole* (Paris, 1913).

MANUEL, mä'nu'ĕl', Nikolaus, called Deutsch (1484–1530). A Swiss painter, poet, and magistrate, born at Bern. His early profession was probably that of an architect or painter and engraver, and in his youth he traveled much, probably visiting Italy, for his early paintings show the influence of the Paduan school. Upon his return to Bern he became a member of the Great Senate (1512), and afterward served in the French army. He was a pronounced supporter of the Swiss reformation. His writings include the fantastic satirical comedies *Vom Papst und seiner Priesterschaft*, *Der Ablasskrämer*, *Berbeli*, and *Elsli Tragdenknaben*, reedited by Tittmann in 1868 and Bachtold in 1878. His works as an artist are very interesting, although his natural genius and inventive power exceed his technical ability, his execution being often faulty; they consist of a few oil and tempera paintings, and a number of drawings, mostly of soldiers and troopers, best studied in the Basel Museum. His frescoes, "The Dance of the Dead," painted on the walls of the Dominican convent (1517–22) at Bern, were destroyed, but have been well copied in the 24 lithographs, *Niklaus Manuels Totentanz* (Bern, 1829–31). In the City Hall at Basel are a number of finely colored stained-glass windows which he designed.

MANUFACTURED ARTICLE. A thing which has been created by the application of labor to crude materials, whereby they are transformed into a new and different quality, shape, or form, having a distinctive name, character, or use, and capable of being used without alteration. The term is sometimes confused with manufactured products, such as pig iron or pig lead, which are merely iron and lead reduced from the native ores and freed from impurities, and which are, in law, considered as raw or crude materials, ready to be manufactured into articles. The word "article," therefore, in its technical legal sense means a thing adapted for use. The distinction between manufactured articles and crude or raw materials is of great importance under tariff and revenue acts where the former are assessed with a higher rate of duty than the latter. The distinction above mentioned has been adopted by the United States courts in the interpretation of tariff laws. For example, India rubber, which is a product obtained by reducing the juice or sap of certain tropical trees and plants to a solid form by dipping convenient molds into it and drying it over a fire made from a peculiar kind of nut, was held not to be a manufactured article under a tariff act taxing articles made of rubber. The court described it as a "raw material in a more portable, useful, and convenient form for other manufactures here." The court, however, held that rubber shoes, made by the same process, except that the mold was in the form of the human foot, were manufactured articles, as they were adapted for immediate use. Consult: Webster Elmes, *Treatise on the Law of the Customs* (Boston, 1887); W. W. Carr, *Judicial Interpretation by the United States Courts of the Acts of Congress Relating to the Tariff Acts* (Philadelphia, 1894); also the authorities referred to under Sale.

MANUFACTURERS, National Association of. An association of American manufacturers organized in Cincinnati in 1895 for the purposes of increasing their export trade, influencing legislation affecting their interests, and of coping with the demands of labor organizations. The association maintains a central office in New York which supplies members with information about foreign markets, prices, credit reports, and undertakes through its international freight bureau the shipment and delivery of foreign consignments. Its most conspicuous function is the energetic campaign which it wages against radical legislation and trade-unionism. The public measures with which the association has been most prominently connected are the reform of the patent law and of the consular and postal services. The association has placed itself on record as not being opposed to labor organizations as such, but maintains that employers must be free to employ their working people without interference on the part of individual organizations and that they must be unmolested in the management of their business and in the use of any methods or systems of pay which are equitable. The association provided for the organization of separate defense associations in the different lines of industry it represents. Provision was further made for the federation of these affiliated protected associations into a "permanent central organization that will create a clearing house for ideas and provide means for coöperation on matters of common interest." In 1907–08 the association aided in conducting a suit against the officers of the American Federation of Labor for participation in a boycott directed against the Bucks Stove and Range Company, whose president was also president of the National Association of Manufacturers. The case, which was regarded by the association as a test case, dragged out through several years; its outcome practically put an end to boycotting through the American Federation of Labor. The association conducts an educational campaign through the distribution of pamphlets, etc., in behalf of its labor and industrial policies. In 1913 it assumed an attitude of active hostility towards the I. W. W. While resistance to what it considers the unreasonable demands of labor is not the only object of the association, it is generally regarded in labor circles as essentially an anti-trade-union organization. The association publishes the *American Trade Index* and the *Confidential Bulletin of Inquiries from Foreign Buyers;* its organ is *American Industries*, published semimonthly at New York.

MANUFACTURES (ML. *manufactura*, from Lat. *manufactus*, *manu factus*, made by hand, from *manu*, abl. sing. of *manus*, hand, and *factus*, p.p. of *facere*, to make). In a broad sense of

the term, manufactures are such forms of industry as elaborate for economic use materials which are themselves the product of industry. Manufactures are thus distinguished from extractive industry, which procures wealth from nature in its primary forms. In practice it is difficult to draw a hard and fast line between these two types of industry, since many commodities which are commonly classed as raw materials have been subject to one or more elaborative processes, as, e.g., raw cotton, raw sugar, pig iron. The practice of American statisticians is to class with extractive industry processes which are directly connected with the exploitation of natural products. Butter and cheese which are made on the farm are treated as agricultural products; when produced in factories distinct from the farm they are classed with manufactures. A product in its earliest merchantable form may then be classed with raw materials; when subjected to further processes of elaboration it becomes a manufactured commodity. For the technical legal distinction in this matter, see MANUFACTURED ARTICLE.

Again, many commodities undergo minor changes incidental to consumption. The preparation of food may be cited as a case in point. Such processes are not usually placed under manufactures. If the preparation of food is carried on in separate establishments with a view to supplying a market, it will fall under the head of manufactures. This distinction is obviously difficult to make in practice. The twelfth census of the United States excludes from manufactures proper most forms of order production, confining the term to production of standard commodities for a general market, while the thirteenth census by statute was "confined to manufacturing establishments conducted under what is known as the factory system exclusive of the so-called neighborhood household and hand industries." In other words, the thirteenth-census manufactures excluded the establishments producing less than $500 worth of products in the year under review, those working to the order of the individual customer, such as custom tailors, dressmakers, shoemakers, etc., but included large concerns doing special work, such as machine shops. Establishments engaged in the building industry other than those manufacturing building materials for the general trade, as well as so-called neighborhood industries and hand trades, such as blacksmithing, harness making, and tinsmithing, in which little, if any, power machinery was used, and which did usually only a local business, were excluded; furthermore, retail stores with incidental manufacturing on a small scale, which could not be distinguished from their mercantile business, and various eleemosynary and penal institutions engaged in manufacturing industries, were also excluded. These considerations must be borne in mind in considering the tables accompanying this article and other tables of manufactures in the United States for this census year under review.

GROWTH OF MANUFACTURING INDUSTRIES IN THE UNITED STATES

From Thirteenth United States Census

	Number of establishments	Capital	Wage earners (average number)	Wages	Cost of materials	Value of products
Factories and hand and neighborhood industries:						
1849 (census of 1850)	123,025	$533,245,000	957,059	$236,755,000	$555,124,000	$1,019,107,000
1859 (census of 1860)	140,433	1,009,856,000	1,311,246	378,879,000	1,031,605,000	1,885,862,000
Per cent of increase, 1849 to 1859	14.1	89.4	37.0	60.00	85.8	85.0
1869 (census of 1870) (gold value)	252,148	1,694,567,000	2,053,996	620,467,000	1,990,742,000	3,385,860,000
Per cent of increase, 1859 to 1869	79.6	67.8	56.6	63.8	93.0	79.5
1879 (census of 1880)	253,852	2,790,273,000	2,732,595	947,954,000	3,396,824,000	5,369,579,000
Per cent of increase, 1869 to 1879	0.7	64.7	33.0	52.8	90.6	74.5
1889 (census of 1890)	355,405	6,525,051,000	4,251,535	1,891,210,000	5,162,014,000	9,372,379,000
Per cent of increase, 1879 to 1889	40.0	133.8	55.6	99.5	52.0	74.5
1899 (census of 1900)	512,191	9,813,834,000	5,306,143	2,320,938,000	7,343,628,000	13,000,149,000
Per cent of increase, 1889 to 1899	44.1	50.4	24.8	22.7	42.3	38.7
Factories, excluding hand and neighborhood industries:						
1899 (census of 1900)	207,514	8,975,256,000	4,712,763	2,008,361,000	6,575,851,000	11,406,927,000
1904 (census of 1905)	216,180	12,675,581,000	5,468,383	2,610,445,000	8,500,208,000	14,793,903,000
Per cent of increase, 1899 to 1904	4.2	41.2	16.0	30.0	29.3	29.7
1909 (census of 1910)	268,491	18,428,270,000	6,615,046	3,427,038,000	12,141,791,000	20,672,052,000
Per cent of increase, 1904 to 1909	24.2	45.4	21.0	31.3	42.8	39.7
Per cent of increase, 1899 to 1909	29.4	105.3	40.4	70.6	84.6	81.2

In the *Census of Production* taken in Great Britain in 1908 of the work of the year 1907 and published in 1912, much the same plan was followed, but the general scheme was more comprehensive. Fisheries and agriculture were omitted, but the products of mines and quarries are included as well as other items.

From a theoretical point of view, however, it is better to include under manufactures all processes of elaboration of merchantable materials into commodities primarily designed for sale. In this sense of the term manufactures presuppose a considerably developed economic life. They did not exist when each household produced exclusively for its own consumption. In western Europe they were first carried on under the guilds (see GUILD), forming, however, but an insignificant part of the economic life. With the rise of capital in the fifteenth and sixteenth centuries manufactures were carried on more extensively under the domestic system. The capitalist-merchant put out materials to be

worked up at home by workmen whose chief occupation was usually agriculture. This form of manufacture still exists in America and England; it is widely practiced in France, Germany, and Russia; and in some European districts, notably in Norway, it is the prevalent form.

In the more advanced nations domestic manufacture has been largely supplanted by the factory system (q.v.). The extension of the market in early modern times, requiring a vastly increased production of goods of standard kinds, led first to excessive division of labor and later to the invention of machinery. The first industries to respond to these influences were the textile and the iron industries.

Manufactures in the United States. At the end of the Colonial period manufacturing industry in America was of slight importance. The principal salable articles were raw materials, such as the products of the forests. Each household provided itself with the chief commodities for consumption. In New England, however, the manufacture of rum was extensive, and the production of hats, coarse cloth, and nails was carried on under the domestic system of industry. The total value of the manufactures of America at the time of the adoption of the Constitution has been estimated at $20,000,000; but this includes much domestic production for home consumption.

Machine production scarcely existed before 1790. In that year a British mechanic, Slater, set up spinning machinery in Rhode Island. In 1794 Whitney invented the cotton gin, thus assuring a supply of raw materials for the new cotton manufacture. By 1810 machinery had been generally introduced in textile manufacture, although large quantities of goods were still produced under the older system. The value of textiles produced in that year was estimated at about $40,000,000.

The iron manufacture developed more slowly. Machinery of improved types was introduced in the first and second decades of the nineteenth century, but the greater part of the production and manufacture was carried on in a primitive fashion, until the fifth decade of the century, when anthracite began to be substituted for charcoal in smelting. From that time increase was rapid.

The value of the manufactures of the United States for the year 1810 was estimated by Tench Coxe to be $198,613,471. In 1820 the value was $268,000,000. The accompanying table, taken from the *Thirteenth Census, Manufactures*, vol. viii (Washington, 1913), shows the growth of manufactures from 1850.

In estimating the economic significance of the development of manufactures, shown in the table on page 37, it will be necessary to make allowance for the fact that a considerable number of operations are now carried on as manufactures

INDUSTRY (1909)	Number of establishments	WAGE EARNERS		VALUE OF PRODUCTS		VALUE ADDED BY MANUFACTURE	
		Average number	Rank	Amount (expressed in thousands)	Rank	Amount (expressed in thousands)	Rank
All industries	268,491	6,615,046	....	$20,672,052	....	$8,529,261	....
Slaughtering and meat packing	1,641	89,728	16	1,370,568	1	167,740	12
Foundry and machine-shop products	13,253	531,011	2	1,228,475	2	688,164	1
Lumber and timber products	40,671	695,019	1	1,156,129	3	648,011	2
Iron and steel, steelworks and rolling mills	446	240,076	6	985,723	4	328,222	4
Flour-mill and gristmill products	11,691	39,453	30	883,584	5	116,008	18
Printing and publishing	31,445	258,434	5	737,876	6	536,101	3
Cotton goods, including cotton small wares	1,324	378,880	3	628,392	7	257,383	7
Clothing, men's, including shirts	6,354	239,696	7	568,077	8	270,562	6
Boots and shoes, including cut stock and findings	1,918	198,297	8	512,798	9	180,060	10
Woolen, worsted, and felt goods, and wool hats	985	168,722	9	435,979	10	153,101	15
Tobacco manufactures	15,822	166,810	10	416,695	11	239,509	8
Cars and general shop construction and repairs by steam-railroad companies	1,145	282,174	4	405,601	12	206,188	9
Bread and other bakery products	23,926	100,216	14	396,865	13	158,831	14
Iron and steel, blast furnaces	208	38,429	31	391,429	14	70,791	30
Clothing, women's	4,558	153,743	11	384,752	15	175,964	11
Smelting and refining, copper	38	15,628	38	378,806	16	45,274	36
Liquors, malt	1,414	54,579	25	374,730	17	278,134	5
Leather, tanned, curried, and finished	919	62,202	23	327,874	18	79,595	27
Sugar and molasses, not including beet sugar	233	13,526	41	279,249	19	31,666	41
Butter, cheese, and condensed milk	8,479	18,431	36	274,558	20	39,012	39
Paper and wood pulp	777	75,978	17	267,657	21	102,215	21
Automobiles, including bodies and parts	743	75,721	19	249,202	22	117,556	17
Furniture and refrigerators	3,155	128,452	13	239,887	23	131,112	16
Petroleum, refining	147	13,929	40	236,998	24	37,725	40
Electrical machinery, apparatus, and supplies	1,009	87,256	18	221,309	25	112,743	20
Liquors, distilled	613	6,430	43	201,699	26	168,722	13
Hosiery and knit goods	1,374	129,275	12	200,144	27	89,903	23
Copper, tin, and sheet-iron products	4,228	73,615	20	199,824	28	87,242	25
Silk and silk goods, including throwsters	852	99,037	15	196,912	29	89,145	24
Smelting and refining, lead	28	7,424	42	167,406	30	15,443	43
Gas, illuminating and heating	1,296	37,215	32	166,814	31	114,386	19
Carriages and wagons and materials	5,492	69,928	21	159,893	32	77,942	28
Canning and preserving	3,767	59,968	24	157,101	33	55,278	31
Brass and bronze products	1,021	40,618	29	149,989	34	50,761	34
Oil, cottonseed, and cake	817	17,071	37	147,868	35	28,035	42
Agricultural implements	640	50,551	26	146,329	36	86,022	26
Patent medicines and compounds and druggists' preparations	3,642	22,895	35	141,942	37	91,566	22
Confectionery	1,944	44,638	27	134,796	38	53,645	32
Paint and varnish	791	14,240	39	124,889	39	45,873	35
Cars, steam-railroad, not including operations of railroad companies	110	43,086	28	123,730	40	44,977	37
Chemicals	349	23,714	34	117,689	41	53,567	33
Marble and stone work	4,964	65,603	22	113,093	42	75,696	29
Leather goods	2,375	34,907	33	104,719	43	44,692	38
All other industries	61,887	1,648,441	....	4,561,002	....	2,084,399	....

which formerly were a part of household industry. The increase in the net product of manufactures above cost of material is not wholly a net increase in national income, although the greater part may be so regarded. It is further to be kept in mind that the statistics of capital are based upon estimates which in the nature of the case are not very reliable.

The accompanying table shows the extent and rank in value of products of the more important manufacturing industries of the United States in 1909. The various manufacturing industries of the United States arranged in order of the amount of products in the census year 1909 are given in the accompanying table from the *Thirteenth Census, Manufactures*, vol. viii (Washington, 1913).

The four States New York, Pennsylvania, Illinois, and Massachusetts, as shown by the census of 1909, produce nearly one-half the manufactures of the United States. The greatest concentration of manufacturing industry is in southern New England and New York and eastern Pennsylvania, but there appears to be a general tendency towards extension of the area of manufactures. Consult sections on *Manufactures* in the articles on the various States; also under UNITED STATES and various other countries.

The United States occupies at present the foremost rank as a manufacturing nation. The successive stages by which it has reached this position are illustrated by the accompanying table, taken from the *Twelfth Census, Manufactures*, part i (Mulhall's estimates). These figures, which are as late as any statistician has presented on a comparative basis, must of course be considered with due regard to modern conditions when the annual value of manufactures has risen to over $20,000,000,000 in the United States and in the United Kingdom to over $8,750,000,000.

ANNUAL VALUE OF MANUFACTURES

	1820	1840
United Kingdom	$1,411,000,000	$1,833,000,000
France	1,168,000,000	1,606,000,000
Germany	900,000,000	1,484,000,000
Austria	511,000,000	852,000,000
United States	268,000,000	467,000,000
Other States	1,654,000,000	2,516,000,000

	1880	1894
United Kingdom	$2,808,000,000	$4,263,000,000
France	2,092,000,000	2,900,000,000
Germany	1,995,000,000	3,357,000,000
Austria	1,129,000,000	1,596,000,000
United States	1,907,000,000	9,498,000,000
Other States	3,455,000,000	5,236,000,000

For the manufacturing industries of Europe there are not available statistics compiled along the lines of the United States census. In 1908 there was taken in Great Britain a *Census of Production* for the year 1907, and the final report published in 1912 summarized the results.

While differences of classification and method do not permit exact comparison between the manufacturing industries of Great Britain and those of the United States, yet the final report of the *Census of Production* of the United Kingdom, referred to above, affords some statistics which may be of significance in this connection. During the census year 1907 the manufacturing industries of England and Wales, Scotland, and Ireland represented a gross output measured by selling value or value of work done of £1,765,366,000. The cost of materials used amounted to £1,028,346,000; the work given out, or the amount paid to other firms, aggregated £24,885,000. The net output of productive industries, obtained by deducting from the value of the gross output the cost of materials and the amount of work given out to other firms, was £712,135,000. In these various manufacturing industries there were employed, exclusive of outworkers, 6,984,976 persons, and the net output per person employed, excluding outworkers, was £102. The total horse power of the engines owned in the various manufacturing establishments was 10,755,009.

Bibliography. For the rise of manufactures in England: Ashley, *Economic History* (London, 1888–93), and Cunningham, *Growth of English Industry* (Cambridge, 1890–92). For the growth of manufactures in America: C. D. Wright, *Industrial Evolution of the United States* (New York, 1897), D. A. Wells, *Recent Economic Changes* (ib., 1899); and, in general, George Unwin, *Industrial Organization in the Sixteenth and Seventeenth Centuries* (Oxford, 1904); Arthur Shadwell, *Industrial Efficiency: A Comparative Study of Industrial Life in England, Germany, and Austria* (2 vols., London, 1906); C. R. Gibson, *Romance of Modern Manufacture* (Philadelphia, 1910); J. C. Duncan, *Principles of Industrial Management* (New York, 1911). Consult also the several censuses of the United States, particularly the *Twelfth Census* (Washington, 1903) and *Thirteenth* (ib., 1913); *Final Report, Census of Production of United Kingdom, 1907* (London, 1912); M. G. Mulhall, *Dictionary of Statistics* (ib., 1903); A. D. Webb, *New Dictionary of Statistics* (ib., 1911). See the articles on the manufacturing industries, such as COTTON; IRON AND STEEL; WOOL; ETC.

MANUFACTURES, AMERICAN. See UNITED STATES, *Manufactures*.

MANUL, mä'nul (Malay word). A small wild cat (*Felis manul*) of Tibet and Siberia. It is whitish gray, with black marks on the chest and about the head and dark vertical bands across the loins. It has a very broad, round head. The cat is about 30 inches in length, the tail measuring a third of this. The chief character is the very dense and long fur adapted to the intense cold of the creature's haunts. Instead of being a jungle animal it makes its home among barren rocks, feeding on picas and other small mammals. It has been suggested that this is the ancestor of the Persian breed of domestic cats, but facts which rather negative this view are the smallness of the ears and the contraction of the pupils to circles instead of slits.

MANUMIS'SION (Lat. *manumissio*, from *manumittere*, to manumit, from *manus*, hand + *mittere*, to send). In Roman law, the enfranchisement of a slave. In the older law (*jus civile*) this could be accomplished: (1) *Vindicta*, i.e., by a fictitious action. In the later law the forms of suit were dropped and the master simply appeared before the magistrate and declared that the slave was to be set free. (2) *Censu*, i.e., by the entry of the slave's name, with the assent of the master, on the register of citizens. This form disappeared in the Im-

perial period. (3) *Testamento*, i.e., by a bequest of liberty in the master's will. When the Roman Empire became Christian a fourth mode of manumission was recognized—*manumissio in ecclesia*, by declaration of the master in the presence of priest and congregation. Informal manumissions "among friends," or "by letter," were originally void; but in the later Republican period individuals thus freed were protected by the magistrates and in the Imperial period they were recognized as legally free. These informal manumissions were regulated, under Justinian, by requiring five witnesses to prove the manumission. The right of a master to manumit his slaves was restricted in the Imperial period. Some of the restrictions were imposed in the interest of creditors; others in the interest of the public.

By manumission the slave usually became a citizen, but his political rights were restricted. Moreover, he remained for life in a relation of dependency; he was the "client" of his master and of his master's children and owed them certain semifeudal observances and services. He and his children were also debarred from marriage with free-born persons. Consult the authorities referred to under CIVIL LAW.

Among the early Germans also the ordinary forms of manumission, by the act of the master alone, gave the freedman only a partial freedom; he was dependent upon his former master for protection. There were, however, methods of manumission which gave the former slave the full rights of a freeman, viz., his adoption into a kinship group or into the tribe.

MANURES AND MANURING (from OF. *manuœvrér*, *manovrer*, Fr. *manœvrer*, to manage, work by hand, from OF. *manouvre*, *manovre*, from ML. *manuopera*, *manopera*, a working with the hand, from Lat. *manus*, hand + *opera*, work). In a broad sense, the term "manure" is applied to any substance used to increase the productiveness of soil. The word is commonly used in a more restricted sense to mean the excreta (solid and liquid) of farm animals, either mixed or unmixed with litter, and more or less fermented. In this article the term is used in its broader sense. Manures may be direct or indirect in their effect. The former supply plant food which is lacking in the soil, the latter render active the insoluble fertilizing constituents already present and improve the chemical, physical, and biological conditions in the soil. The first class includes the so-called commercial or artificial fertilizers, such as superphosphates, nitrate of soda, etc.; the second embraces natural manures, such as the green manures, seaweed (q.v.), and animal manures. A third class includes the soil amendments or soil improvers, such as marl, lime, gypsum, salt (q.v.), etc., and the so-called catalytic or stimulant fertilizers, such as salts of manganese, aluminium, iron, boron, lead, zinc, etc., whose fertilizing value has not yet been definitely determined. Under certain conditions most of these manures may be both direct and indirect in their action.

Plants derive the larger part of their food directly or indirectly from the atmosphere. A small but very essential portion, however, is drawn from the soil. This includes the inorganic or ash constituents and nitrogen, which, however, is in certain cases derived indirectly from the air. Of the soil constituents which plants need those most likely to be exhausted by ordinary systems of cropping are nitrogen, phosphoric acid, potash, and, in some cases, lime and possibly sulphur. Direct manures supply one or more of these constituents. The fertility of the soil would remain practically unchanged if all the ingredients removed in the various farm products were restored to the land. This may be accomplished to a large extent by feeding the crops grown on the farm to animals, carefully saving the manure and returning it to the soil, and when practicable combining a judicious use of green manures with a system of stock feeding in which those farm products comparatively poor in fertilizing constituents are exchanged for purchased feeding stuffs rich in these substances. Under such practice the loss of soil fertility may be reduced to a minimum or there may even be an actual gain in fertility. Under ordinary conditions of farming, however, the manure produced on the farm is not sufficient to maintain its fertility. Roberts estimates that in ordinary mixed husbandry only about one-half of the fertility taken from the soil by crops is restored in farm manures. Hence the necessity for supplying the deficiency from other sources, resulting in the wide use of artificial or commercial fertilizers of various kinds.

Natural Manures. These include all manurial substances derived from natural sources without undergoing any specific treatment or process of manufacture, such as animal excreta, animal and vegetable refuse of the farm, and peat, as well as various factory wastes. The natural manures are, as a rule, bulky in character and contain small amounts of the essential constituents. The most important and useful of the natural manures is farmyard or barnyard manure. Its quality, which is very variable, depends upon the care taken in its preservation, the kind and age of the animal producing it, the quantity and quality of the food used, nature and amount of the litter added.

Mature animals, neither gaining nor losing weight, excrete practically all of the fertilizing constituents consumed in the food. Growing animals and milch cows excrete from 50 to 75 per cent of the fertilizing constituents of the food; fattening or working animals from 90 to 95 per cent. Roberts states that the value of the manure produced by animals is from 30 to 50 per cent of that of the food they consume. As regards the fertilizing value of equal weights of manure in its normal condition, farm animals probably stand in the following order: poultry, sheep, pigs, horses, cows. Poultry manure is the richest of the animal manures, because it consists of a mixture, in somewhat concentrated form, of both the solid (intestinal) and liquid (urinary) excreta. The liquid excretum of farm animals is the most valuable part of the manure, being especially rich in nitrogen and potash, but poor in phosphoric acid. Sheep manure is drier and hence richer in fertilizing constituents than pig, horse, or cow manure. Pig manure contains as much water as cow manure and more than horse manure, but is richer in nitrogen. Horse manure is a comparatively dry manure, which ferments rapidly. For this reason it is called a hot manure and is especially valuable for use in hotbeds and for forcing early crops. Cow manure is a wet cold manure, which ferments slowly. Its low percentage of fertilizing constituents is due to its high percentage of water. The amounts of fer-

tilizing constituents in animal manure stand in direct relation to those in the food. As regards the value of the manure produced the concentrated feeding stuffs, such as meat scrap or meal, cottonseed meal, linseed meal, gluten meal, and wheat bran, stand first; the leguminous plants (clover, peas, beans, etc.) second; the grasses third; cereals (oats, corn, etc.) fourth; and root crops, such as turnips, beets, and mangel-wurzels, last. High salting and succulent foods as a rule give watery and poor manure. With high feeding there is less complete digestion and hence richer manure. Highly nitrogenous foods give richer manures, although at the same time they increase the excretion of urine, thus requiring more bedding and reducing the value of the manure, if, as is frequently the case, the material used as litter is poorer in fertilizing constituents than the animal excreta. Animals kept in cold quarters probably digest their food more closely, and hence make poorer manure.

Barnyard manure rapidly deteriorates from two chief causes: (1) fermentation, which begins as soon as the manure is dropped; (2) weathering and leaching, which rapidly reduce the value of unprotected manure. Roberts reports experiments at Ithaca, N. Y., in which manure exposed in loose heaps of from two to 10 tons each lost from 42 to 62 per cent of its value in six months, and cow manure 30 per cent; while mixed and composted manure lost only 9 per cent. The loss from destructive fermentation may be considerably reduced by the use of proper absorbents (litter), but the most perfect preservation is secured by storing the mixed manure of different animals under cover and keeping it compact to exclude air. Extremes of temperature and moisture should be avoided to prevent "fire-fanging" and to secure a uniform, moderate, and harmless fermentation. Such fermentation, in fact, improves the quality of poor, coarse manure by rendering its constituents more available as plant food.

When practicable, it is best to avoid storage by hauling the manure directly to the fields and spreading it upon land occupied by plants. From 10 to 40 tons per acre is usually applied. Moderate applications at frequent intervals are preferable to large but infrequent applications, except when the purpose is to warm the soil to force early crops. Excessive use of manure, as in forcing-house work, sometimes causes the soil to become "manure sick." Heating the soil has been suggested as a remedy. The forcing effect of fresh manure renders it better suited to early garden truck, grasses, and forage plants than to plants grown for seed, such as cereals. Direct applications to root crops, such as sugar beets, potatoes, or tobacco, often prove injurious. This result can, as a rule, be avoided by applying the manure some months before the planting of the crop or by using only well-rotted manure. Barnyard manure is not applied to fruit trees with the same good results as in case of other crops. It does not stimulate fruiting to the same extent as the mineral fertilizers. This is probably due to the fact that it is poor in total and available mineral constituents and comparatively rich in nitrogen, which tends to produce large growth but a poor quality of fruit. As a rule, therefore, the best results are likely to be obtained by using barnyard manure in connection with commercial fertilizing materials, lime, gypsum, etc., either in compost (q.v.) or separately.

Other natural manures of secondary importance are peat, ashes (qq.v.), wool waste, which contains on an average 5.5 per cent of nitrogen, 1 per cent of phosphoric acid, and 2 per cent of potash; hair waste, containing 7 per cent of nitrogen and less than 1 per cent of phosphoric acid; felt waste, with about 8 per cent of nitrogen; leather, with about 7 per cent of nitrogen. Peat and the wastes mentioned are principally valuable for the nitrogen they contain, but this is very slowly available to plants and hence not of great value.

AMOUNT AND VALUE * OF MANURE PRODUCED BY FARM LIVE STOCK

(New York Cornell Experiment Station and other sources)

KIND OF ANIMAL	Amount of excrement per 100 pounds live weight per day	COMPOSITION AND VALUE OF MANURE (MIXED EXCREMENT AND LITTER)†			
		Nitrogen	Phosphoric acid	Potash	Value per ton
	Pounds	*Per cent*	*Per cent*	*Per cent*	
Sheep	34.1	.768	.391	.591	$3.30
Calves	67.8	.497	.172	.532	2.18
Pigs	56.2	.840	.390	.320	3.29
Cows	74.1	.426	.290	.440	2.02
Horses	48.8	.490	.260	.480	2.21
Poultry	‡	.500	.350	.850	7.07

* Valuing nitrogen at 15 cents, phosphoric acid at 6 cents, and potash at 4½ cents per pound.
† Fine-cut straw of known composition in sufficient quantity to keep the animals clean.
‡ According to the Maine Experiment Station each hen produces about 30 pounds per year of manure which can be saved.

Intermediate in character between the natural manures proper and artificial or commercial fertilizers are the soil amendments or soil improvers and the so-called catalytic or stimulant fertilizers, to which reference has already been made, and which are valuable as a rule for their indirect or stimulant effect rather than as direct sources of plant food.

Artificial or Commercial Fertilizers. With the continued sale of products from the farm the natural manures available are often insufficient, as already explained, to maintain the original fertility of the soil. In specialized intensive farming, moreover, there is a demand for an abundant supply in the soil of more active plant food than farm manures furnish, in order that the high-value crops grown under such conditions may be forced into early, rapid, and vigorous growth. Under such circumstances the more concentrated and available forms of commercial fertilizing materials are used to good advantage. There are numerous sources of supply of such

materials, which may be divided into three classes, viz., nitrogenous, furnishing nitrogen; phosphatic, furnishing phosphoric acid; and potassic, furnishing potash. It is assumed in the preparation of fertilizers that the constituents most likely to be deficient in soils are nitrogen, phosphoric acid, and potash. A fertilizer, therefore, containing all three of these is termed complete, one containing only one or two of them incomplete. The price of a fertilizer is based upon the price of the nitrogen, phosphoric acid, and potash it contains.

Nitrogen, the most costly ingredient of fertilizers, is derived mainly from organic matter, ammonium salts, and nitrates, but also in recent years from calcium cyanamide (see CYANAMID), containing about 20 per cent of nitrogen as offered for sale as a fertilizer. Nitrates furnish the most available form of nitrogen. The nitrate most commonly used as a fertilizer is nitrate of soda (Chile saltpetre), which contains on the average 16 per cent of nitrogen, although basic calcium nitrate, containing 13 per cent of nitrogen, a product obtained, like calcium cyanamide, from electrical fixation of the free nitrogen of the air, is also coming into use as a fertilizer and is considered somewhat more effective than nitrate of soda on soils in need of lime as well as nitrogen. The more valuable sources of organic nitrogen are dried blood and tankage, which are produced in large quantities in slaughterhouses and rendering establishments; dried fish, residue from fish oil and canning establishments; and cottonseed meal, a by-product of cottonseed-oil manufacture. (See table on page following for composition.) Nitrogen in the form of ammonium salts stands between that of nitrates and organic nitrogen as regards efficiency. It is obtained for use as a fertilizer almost exclusively as ammonium sulphate, prepared largely as a by-product of gas works, coke ovens, etc., and containing on an average about 20 per cent of nitrogen. The nitrates are readily available, but also very soluble, and hence likely to be rapidly leached out of the soil. The ammonia salts, however, while considered less efficient than nitrates, are not so readily leached out of the soil, although extremely soluble. When used with proper precaution the nitrogen of calcium cyanamide is considered about as efficient as that of ammonium salts. The organic forms of nitrogen are practically insoluble and unavailable until they have been converted into ammonia compounds and undergone nitrification (q.v.) in the soil. They vary widely with respect to the rapidity with which these changes occur, dried blood and meat products, freed as completely as possible from fat, standing first, cottonseed meal and similar vegetable products next, and leather, hair, horn, and hoof lowest.

Phosphoric acid of fertilizers is derived from bone, mineral phosphates, and phosphatic, basic, or Thomas slag, a by-product of the manufacture of steel from phosphatic ores. In these it is present mainly as calcium phosphate (tricalcium phosphate, $(CaO)_3 \cdot P_2O_5$, in the first two, tetracalcium phosphate, $(CaO)_4 \cdot P_2O_5$, in the last). It is found in fertilizers in three forms: (1) tricalcium phosphate, largely insoluble in water and other weak solvents, designated in fertilizer analysis as "insoluble" phosphoric acid; (2) soluble in water and readily available to plants, as the superphosphates, which are prepared from bones, bone black, mineral phosphates, etc., by grinding and treatment with sulphuric acid, thus converting the insoluble tricalcium phosphate into soluble monocalcium or acid phosphate, $CaO \cdot (H_2O)_2 \cdot P_2O_5$; (3) "reverted," or in form of dicalcium phosphate, $(CaO)_2 \cdot H_2O \cdot P_2O_5$, which is not soluble in pure water, but is soluble in weak solutions of organic acids and their salts. This form results from the tendency of soluble monocalcium phosphate to revert to a less soluble (dicalcic) form. In fertilizer analyses it is classed with the water-soluble as available.

Potash, as a constituent of fertilizers, exists in a number of forms, but chiefly as chloride or muriate and as sulphate. All forms are freely soluble in water and are believed to be nearly, if not quite, equally available, but it has been found that the chlorides may injuriously affect the quality of tobacco, potatoes, and certain other crops. The chief sources of potash are the potash salts from Stassfurt, Germany—kainite, carnallite, sylvinite, muriate of potash, sulphate of potash, and double-manure salt (sulphate of potash and magnesia). Wood ashes and cotton-hull ashes are also important sources of potash, and the Pacific coast kelps (see KELP), which are very rich in potash, have recently been exploited for this purpose. Kainite, carnallite, and sylvinite are crude products of the mines, and contain, in addition to potash, a number of other salts, chiefly sodium chloride and magnesium sulphate. Kainite and the sulphate and chloride are the principal salts on the market for fertilizing purposes. The potash in kainite, though in the form of a sulphate, produces an effect quite similar to that derived from the use of muriate, because of the large quantities of chlorides mixed with it. It contains on the average about 12½ per cent of actual potash. The muriate and sulphate are refined products and contain on the average not less than 50 per cent of actual potash. The chief impurity in the case of the muriate is common salt. High-grade double sulphate of potash and magnesia ("double-manure salt"), which is used to a limited extent as a fertilizer, contains about 26 per cent of actual potash, though much lower grades of this material are found. See also table of composition below.

The substances referred to above as the sources of nitrogen, phosphoric acid, and potash are the raw materials from which the various manufactured brands of fertilizers are compounded. The quality of a mixed fertilizer will depend upon the character of the raw materials selected, as regards both amount and availability of their fertilizing constituents, and upon the proportions in which they are mixed. For instance, in one brand the nitrogen may be entirely in the form of insoluble organic materials and the phosphoric acid as insoluble mineral phosphates, while in another all three forms of nitrogen may have been used, viz., nitrates, ammonium salts, and organic matter, with phosphoric acid entirely in the form of superphosphate. The total plant food may be just as large in the first as in the second brand, but its availability and the immediate effects from its use would be much larger in the second case than in the first. Since chemical analysis cannot always tell with certainty the source and availability of the essential constituents of fertilizers, especially of the organic nitrogen, it is often desirable to purchase the unmixed materials, either for use

separately or to be mixed on the farm as required.

To use fertilizers to the best advantage it is necessary to take into consideration a variety of conditions, among the more important of which are the character of the fertilizer itself, the character of the soil and its previous manuring and cropping, the climate, and the crop to be grown. In general, concentrated fertilizers prove most profitable on: (1) soils in good physical condition, i.e., well tilled and abundantly supplied with humus; and (2) high-value crops, such as are grown in market gardening. Different classes of farm crops vary in their fertilizer requirements. The cereals, maize excepted, and grasses are similar in their habits of growth and are able to utilize comparatively insoluble forms of mineral plant food, but are much benefited by nitrogen, especially nitrates, applied in time to carry them through the period preceding maturity. It is for the latter reason that nitrogen has been termed the ruling or dominant element for this class of plants. Leguminous plants—clover, peas, beans, etc.—which are capable of acquiring nitrogen partly from the air, make liberal use of the mineral constituents, especially potash and lime. Fertilizers for such plants should therefore contain an abundance of the mineral constituents only, potash being the dominant element. Root and tuber crops require an abundance of all the fertilizing constituents in readily available forms. Of the three classes of fertilizing constituents, the nitrogen is especially useful for the slow-growing beets and mangels; soluble phosphates in abundance for the turnip; and potash for potatoes, white and sweet. That is, while the fertilizers should contain all three elements, individual crops, because of their peculiarities of growth, require certain fertilizing constituents in greater relative amounts and in immediately available forms. Fruit trees are slow-growing plants and therefore do not need quick-acting fertilizers as a rule. Highly soluble manures, such as nitrate of soda, are likely to be washed out of the soil without being utilized. For this reason the use of nitrate of soda is not advised except where the growth of nursery stock is to be forced or where bearing trees exhibit a lack of luxuriance in foliage. Frequently, however, it is desirable to stimulate the growth and fruitfulness of the trees, and for this purpose more active fertilizing materials than the above are needed. In selecting and mixing the latter the fact that fruits are potash feeders should be taken into consideration. The fertilizer requirements of small fruits are similar to those of orchard fruits, but, being as a rule more rapid growers, they can utilize to advantage heavier applications of soluble fertilizing materials and do not derive the same benefit as orchard fruits from slowly decomposing manures.

It may be said that in general crops grown on soils poor in decaying vegetable matter (humus) are as a rule benefited by applications of nitrogenous manures, while those grown upon soils well supplied with this substance are more

COMPOSITION OF THE PRINCIPAL COMMERCIAL FERTILIZING MATERIALS

	Nitrogen	Available phosphoric acid	Insoluble phosphoric acid	Total phosphoric acid	Potash	Chlorine
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
1. Supplying nitrogen:						
Nitrate of soda	15.5 to 16					
Calcium nitrate, basic	13					
Sulphate of ammonia	19 to 20.5					
Calcium cyanamide	20					
Dried blood (high grade)	12 to 14					
Dried blood (low grade)	10 to 11	.....	.....	3 to 5		
Concentrated tankage	11 to 12.5	.....	.....	1 to 2		
Tankage (bone)	5 to 6	.....	.....	11 to 14		
Dried fish scrap	7 to 9	.....	.....	6 to 8		
Cottonseed meal	6.5 to 7.5	.....	.....	1.5 to 2	2 to 2	
Castor pomace	5 to 6	.....	.....	1 to 1.5	1 to 1.5	
2. Supplying phosphoric acid:						
South Carolina rock phosphate	.....	.....	26 to 28	26 to 28		
South Carolina rock superphosphate (dissolved South Carolina rock phosphate)	.....	12 to 15	1 to 3	13 to 16		
Florida land rock phosphate	.....	.....	33 to 35	33 to 35		
Florida pebble phosphate	.....	.....	26 to 32	26 to 32		
Florida superphosphate (dissolved Florida phosphate)	.....	14 to 16	1 to 4	16 to 20		
Bone black	.....	.....	32 to 36	32 to 36		
Bone black superphosphate (dissolved bone black)	.....	15 to 17	1 to 2	17 to 18		
Ground bone	2.5 to 4.5	5 to 8	15 to 17	20 to 25		
Steamed bone	1.5 to 2.5	6 to 9	16 to 20	22 to 29		
Dissolved bone	2 to 3	13 to 15	2 to 3	15 to 17		
Thomas slag	.....	.....	.....	*11.4 to 23		
3. Supplying potash:						
Muriate of potash	.....	.....	.....	.....	48 to 52	45 to 48
Sulphate of potash (high grade)	.....	.....	.....	.....	48 to 52	.5 to 1.5
Sulphate of potash and magnesia	.....	.....	.....	.....	26 to 30	1.5 to 2.5
Kainite	.....	.....	.....	.....	12 to 12.5	30 to 32
Sylvinite	.....	.....	.....	.....	16 to 20	45 to 46
Cotton-hull ashes†	.....	.....	.....	7 to 9	20 to 30	
Wood ashes (unleached)†	.....	.....	.....	1 to 2	2 to 8	
Wood ashes (leached)†	.....	.....	.....	1 to 1.5	1 to 2	
Tobacco stems	2 to 3	.....	.....	3 to 5	5 to 8	
Giant kelps, Pacific coasts, dry	.....	.....	.....	.....	20	

* In good Thomas slag at least 80 per cent of the phosphoric acid should be soluble in ammonium citrate, i. e., available.

† Cotton-hull ashes contain about 10 per cent of lime, unleached wood ashes 30 to 35 per cent, and leached wood ashes 35 to 40 per cent.

benefited by phosphates and potash. Upon heavy soils phosphates are likely to be more beneficial than nitrogen, while the reverse is the case on light dry soil. Sandy soils are as a rule deficient in potash, while clayey soils contain this element in larger quantities. Deep-rooting crops with long seasons of growth are able to acquire the necessary plant food where shallow-rooted and short-season crops would suffer. As regards the different forms of fertilizing materials it may be said that nitrates and soluble phosphates should be applied only a short time before they are required by the plant. Potash salts, ammonium sulphate, organic nitrogenous matter, and insoluble phosphates, being less likely to be converted into less available forms or leached out of the soil, may be safely applied weeks or even months before they are needed. In general farm practice the best results are likely to be obtained in the use of fertilizers by applying them systematically, i.e., by adopting a combined system of rotation and manuring which is adapted to the given conditions of crop, climate, and season, and which provides for the utilization to the best advantage of the home and local supplies of manures.

The preparation and use of commercial fertilizers on an extensive scale practically dates from the announcement of Liebig's theory of plant nutrition in 1840 and the publication soon after of the results of Lawes's experiment on the preparation and use of superphosphates as a fertilizer. Since that date the industry has grown to enormous proportions. A recent estimate values the world's consumption of fertilizers at $400,000,000.

The composition of the more important materials used in the preparation of fertilizers is shown in the table on the preceding page.

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MANUSCRIPT (Lat. *manu scriptum*, written by hand). A term applied to anything written by hand, on either hard or soft and flexible substances. The hard substances are principally stones, metals, bone, and wood, on which the writing is in the nature of engraving; the soft or flexible substances are especially papyrus, wax, parchment and other skins, textiles, and paper, while terra cotta or clay partakes of both classes. The instruments used were the wedge, stylus, brush, and graver for the hard, and the reed, quill, stylus, and metal pen for the soft substances. The stone chisel was used in rock writings. In the matter of inks, black was always the ordinary color, and red was used at an early date (e.g., in Egypt) for decorative purposes; other colors had a special meaning, as purple was the Imperial color of the Byzantine and Carlovingian emperors and yellow the Imperial color in China. For the history of the methods of production and preservation of various kinds of manuscripts, see BOOK; CODEX; CUNEIFORM INSCRIPTIONS; LIBRARIES; PALEOGRAPHY; PAPYRUS.

MANUSCRIPTS, ILLUMINATED. See ILLUMINATED MANUSCRIPTS.

MANUTIUS, mȧ-nū'shĭ-ŭs. The Latin name of a famous family of Italian printers.—TEOBALDO MANUCCI, better known as ALDO MANUZIO (Aldus Manutius), was born at Sermoneta, near Rome, in 1450. Having studied Latin at Rome under Gasparino da Verona and Greek at Ferrara under Battista Guarini, Manuzio went in 1482 to live at Mirandola with his old friend Giovanni Pico. Pico got Manuzio a place as tutor to his nephews, Alberto and Lionello Pio, princes of Carpi. Alberto supplied the funds with which Manuzio, in company with Andrea Torresano d'Asola, bought the press of Nicolas Jenson, and brought the great Aldine firm into existence. Manuzio, or Aldo, to use the name now most familiar, settled in Venice in 1490, and soon published the undated *Hero and Leander* of Musæus, the *Galeomyomachia*, and the Greek Psalter. In 1495 the first volume of Aristotle appeared. Nine comedies of Aristophanes followed in 1498. Thucydides, Sophocles, and Herodotus came out in 1502; Xenophon's *Hellenics* and Euripides appeared in 1503, Demosthenes in 1504. In 1513 Plato was issued, and Pindar, Hesychius, and Athenæus came out in 1514. Aldo's press now devoted itself to printing Latin and Italian works, including the *Divine Comedy*. These works (1495–1514) were printed with Aldine types, a style cast by Francesco da Bologna and quite absurdly, according to a legend originating in an error of A. Firmin Didot (1872), said to have been copied from the handwriting of Petrarch. Italic type was invented by Aldo, as is shown by his *Monitum* of March 16, 1503, reprinted in Renouard (vol. iii). Italics were soon adopted by Lyonese printers. Apparently the first book thus printed at Lyons was issued in 1501. Aldo was an ardent humanist, and the Academy of the Filelleni (better known as the Aldine Academy), which he gathered around him, has the distinction of being one of the most serious in purpose and accomplishment of the time. He loved the books that he printed and wished to make not only them but his manuscripts accessible to many. Symonds roughly estimates the current price of Aldo's pocket series of Greek, Latin, and Italian classics, begun in 1501, at two shillings a volume. It would seem that Aldo's books were cheaper than those of modern publishers, who have hardly surpassed him in quality at their best. In 1499 Aldo had wedded Maria, the daughter of his colleague Andrea Torresano. On Feb. 6, 1515, Aldo died, leaving three sons to help carry on his business.—PAULUS MANUTIUS (1512–74), born in Venice, June 12, 1512, took up in 1533 the task which had meanwhile been done mainly by his grandfather, Andrea Torresano. Paolo set up his own firm and devoted himself mainly to the Latin classics. He skill-

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MINIATURE FROM LATIN MANUSCRIPT BOOK OF HOURS OF THE BLESSED VIRGIN MARY.

fully edited Cicero's *Letters* and *Orations*, and published his own Latin version of Demosthenes. In 1561, at the invitation of Pius IV, he went to Rome, where he was to have 500 ducats a year and enough to defray the cost of his press. The profits were to be equally divided between Paolo and the Camera **Apostolica. Paolo seems** to have fared well under Pius IV, but the coldness of Pius V compelled him to leave Rome. He went back, however, and died there in 1574. His partnership with the papacy was more favorable to theological writers than to classic literature.—ALDUS MANUTIUS, the younger (1547–97), son of Paolo, was born Feb. 13, 1547, and died in Rome, Oct. 28, 1597. At the age of nine his name appeared on the title-page of the *Eleganze della lingua toscana e latina*. In 1561, whether with or without help we do not know, he produced a work on Latin spelling, *Orthographiæ Ratio*, which he completed with an *Epitome Orthographiæ* in 1575, both highly valuable books. In 1572 Aldo married Francesca Lucrezia, daughter of Bartolommeo Giunta, grandson of that Giunta who had established the famous Venetian press. This was a lucky alliance, for the Aldine press had been steadily declining, while the other was growing richer. In 1574 his father's death in Rome made Aldo the younger head of the firm. His commentary of the *Ars Poetica* of Horace (1576) maintained the family's traditional blending of good printing and scholarship. As a professor of belles-lettres Aldo went to Bologna (1585), and thence to Pisa (1587). There he printed Alberti's comedy *Philodoxius*, and attributed it strangely to Lepidus. In 1588 he went to Rome and again turned to printing, with Clement VIII as his patron, until his death.

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MAN WHO LAUGHS, THE. See HOMME QUI RIT, L'.

MAN WITHOUT A COUNTRY, THE. A story by Edward Everett Hale, first published anonymously in the *Atlantic Monthly* (1863).

MANX CAT. See *Domestic Cats*, under CAT.

MANX LITERATURE. The Celtic dialect still spoken by about 3000 persons on the west coast of the Isle of Man is closely related to Irish and Scottish Gaelic, standing nearer on the whole to the latter. (See CELTIC LANGUAGES.) Unlike both of them, Manx has abandoned the traditional Gaelic orthography and modeled its spelling rather upon English. Manx literature, so far as preserved, is scanty and confined to the modern period. The principal monuments are the translations of the Book of Common Prayer and of the Bible. The former was first published in 1765; the latter in 1771–75. But an older manuscript version of the Prayer Book, completed by Bishop Phillips in 1610, has been recently printed by John Rhŷs and A. W. Moore (Douglas, 1895). Moore has also published several books dealing with the history and popular traditions of the Isle of Man. The native literature, of which this author gives specimens, consists principally of ballads, and carvels (the local term for carols) sung on Christmas Eve.

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MAN-YO-SHU, mân′-yō-shōō′ (Jap., Collection of a Thousand Leaves). The most ancient anthology in the Japanese language. It was formed in the eighth century A.D., being one of the first books written in Japan. It retains the highest place in the estimation of Japanese critics, and a whole literature has gathered around it. To the foreign student its chief value is in its facts and allusions, which make it a prime source for the study of ancient Japanese history and sociology.

MANZANARES, män′thä-nä′räs. A town in the Province of Ciudad Real, Spain, situated 98 miles south of Madrid, in a vast and arid plateau known as La Mancha, 1980 feet above the sea level (Map: Spain, D 3). The town is well built and contains a modern church of Gothic architecture and an ancient, moat-surrounded castle, built after the defeat of the Moors at Las Navas de Tolosa (1212). The country around is flat, requiring irrigation to render the soil productive. The climate is healthful and delightful; the chief industry is the raising of saffron and making Valdepeñas wine. There are manufactures of cloth, soap, and brandy. Pop., 1900, 11,181; 1910, 14,176.

MANZANILLO, män′sä-nē′lyō. A port in the Province of Santiago de Cuba, Cuba (Map: Cuba, H 6). It is situated on the west coast of the province, at the head of the Gulf of Guacanayabo, in a low and unhealthful region surrounded by mangrove swamps. Though not very attractive in appearance, it is regularly built, with straight and wide streets crossing at right angles. It has four high schools, several hospitals, and a good market. The roadstead,

protected by the Keys of Manzanillo, forms a capacious harbor. The city serves as the port of Bayamo, and is the outlet for the products of the fertile Cauto Valley, the chief of which are sugar, tobacco, and lumber. It is the seat of a United States consular agent. Pop., 1899, urban, 14,464, municipal, 32,288; 1907, urban, 15,819, municipal, 54,900.

MANZANILLO (*Puerto de Colima*). A seaport of the State of Colima, Mexico, situated on the beautiful bay of Manzanillo, an arm of the Pacific (Map: Mexico, G 8). The Mexican government has transformed the bay into an excellent harbor by the construction of an extensive breakwater and sea wall. It is served by a number of steamship lines, and a national railway connects it with Colima, the capital of the state, 40 miles inland. In 1913 its exports, consisting of bullion, hides, timber, and coffee, were valued at $306,317, and its imports, chiefly machinery and vehicles, amounted to $1,486,148. It is the seat of a United States consul. Pop., 1910, 1503. Consult P. F. Martin, *Mexico of the Twentieth Century* (New York, 1907).

MANZANITA, măn'zȧ-nē'tȧ. A California shrub. See ARCTOSTAPHYLOS and Plate of CALIFORNIA SHRUBS.

MANZONI, mȧn-dzō'nē, ALESSANDRO (1785–1873). An Italian poet and novelist, born at Milan, March 7, 1785. Having completed his early training at Milan and Pavia, he accompanied his mother (a daughter of Cesare Beccaria) to Paris in 1805, and with her he frequented some of the most fashionable salons, especially those in which the encyclopædic and rationalistic ideas of the preceding century still retained a hold. But the skeptical opinions that this Parisian sojourn gave him were not to last. His acquaintance with the French scholar Fauriel began at this time and greatly influenced his later artistic development. Back in Milan in 1808, he married Enrichetta Blondel, a follower of the Reformed religion. The couple went to Paris, and there in 1810 the marriage was resolemnized according to the rites of the Catholic faith, which the wife embraced and which Manzoni practiced from this time on with sincere ardor. After 1810 he made his home in the region of Milan. He was on terms of closest intimacy with such writers as Massimo d'Azeglio, who married his daughter, Tommaso Grossi, the novelist, and Berchet. During his later years he became the acknowledged leader of Italian thinkers and men of letters, among whom he had numberless friends and correspondents. Although an avowed patriot, he played no very public part in the struggles for political independence, so that he was included in no proscription. He became a Senator in 1860. He died May 22, 1873. During his youthful period Manzoni produced poems after the manner of the school of classicists, reflecting his earlier skeptical feelings, e.g., the *Trionfo della libertà*, obviously written under the influence of Monti; a composition in blank verse entitled *In morte di Carlo Imbonati*, and the *Urania*. The period between 1816 and 1825 was his most active one in the production of works in both prose and verse. To it belong the *Inni sacri*, which are full of exalted religious sentiment, one or two political *canzoni*, and the poem that made him really famous, the *Cinque maggio*, an ode on the death of Napoleon (1821). Of this same period are his dramatic compositions with which he hoped to inaugurate a reform in the Italian theatre. They are the *Conte di Carmagnola* and the *Adelchi*, the former published in 1820 and the latter in 1822 (at Milan). Admirable as literary performances, they are not adaptable to scenic production, and neither was well received at home, although Goethe warmly praised the *Conte di Carmagnola*. In connection with these pieces Manzoni enunciated the following principles: the dramatic composer should adapt the poetic invention to the historic fact and not follow the contrary practice; the unities of time and place need not be observed; the style and the dialogue should be perfectly natural; and the chorus, a sort of commentary on the events enacted, should provide a place in which the author may freely express his own feelings. Of the prose publications of Manzoni, noteworthy is the *Morale cattolico* (Milan, 1819), a reply to Sismondi's strictures upon Catholicism. His critical output is remarkable for its trenchancy and soundness. His masterpiece is the novel *I promessi sposi* (The Betrothed) (Milan, 1825–26). Somewhat cumbersome in plot, this romance, for its sage reflections on human nature, its graphic descriptions (especially that of the plague at Milan in 1631), and its masterly portrayal of characters, has deeply influenced mature minds of every nation: such a scholar as the American Andrew D. White calls it the best historical novel ever written. Many of its figures—the unnamed knight, repentant in the consciousness of sin, Fra Cristoforo, the monk of unswerving piety and sacrifice, the weak but very human priest Don Abbondio, Gertrude, the nun with no love for her calling—have become universal types. Aside from its artistic merit, the romance has great value as an historical study of the seventeenth century in Italy. In its revised form (1840) it became the illustration of Manzoni's theory of the national Italian language, as regards vocabulary and syntax (see ITALIAN LANGUAGE), and as such still figures as an important language text in Italian schools. It had numerous epigones among later novels (e.g., the *Monaca di Monza* of Rosini). The ode of *Pentecost* (from the *Inni sacri*) and the *Cinque maggio* (translated into English, Oxford, 1905) are masterpieces of the first order, and are the best reflections of the force of religion in Manzoni's intellectual outlook on life.

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MAORI, mä'ō-rī. The Polynesian race found in New Zealand by the first white men who discovered the island. Above the average in stature, they are more or less robust, with athletic frames. The head form is dolichocephalic. The women for the most part are strong and vigorous. Both sexes are adepts in swimming and the people are fond of bodily exercise. Some authorities hold, on insufficient grounds, that the

Maoris and other Eastern Polynesians are non-Malay, and Caucasic rather than Mongolic, although they admittedly speak dialects of the common Malayo-Polynesian speech. A few more venturesome inquirers have even sought to show that the Maori tongue is related to the Aryan family of languages. But all such efforts are vain. The Moriori of Chatham Islands are hardly more than a branch of the Maori, with perhaps more of a pre-Maori Melanesian intermixture, noticeable not only in physical characteristics, but also in art, weapons, etc. The Maoris are noted for their tattooing, their ornamental and decorative art, their epic poetry, legends, and mythology. In earlier times they were among the most cannibalistic of Polynesian peoples, despite their relatively high culture. Their long and valiant struggle with the British colonists, in the course of which they displayed some brilliant war tactics, gained for them the respect of their opponents, and they now have their representatives in the Legislature on the same basis as their white fellow countrymen. The Maoris, scattered over parts of the northern island and the northern portion of the southern island, seem, according to the last census, to be increasing in numbers. Considerable intermarriage has also taken place. There were two Maoris in the New Zealand cabinet of 1906.

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MAP (from Lat. *mappa*, napkin). The representation of the whole or a portion of the earth's surface, or of the heavens, upon a plane surface, usually on a greatly reduced scale. Map and chart (q.v.) are nearly synonymous terms, though the latter is now chiefly used to designate a map designed for navigational or astronomical purposes. The earliest maps of the simpler sort were doubtless prehistoric, as from the accounts of explorers of old as well as of modern times it has been found that many of the most ignorant and primitive savages make and use rude plans of their surroundings, whether of land or water, while Eskimo and American Indians have been found able to understand the charts of the white man in addition to making for themselves rude maps. The earliest historical record of map making is that of Sargon, King of Akkad, one of the states of Babylonia, which existed before the formation of the Babylonian or Assyrian Empire. The date of these maps is about 3800 B.C., and they are cadastral or topographical surveys, with a pretense at accuracy in the representation of lands, inasmuch as they were prepared for purposes of taxation. Other surveys in Babylonia and Assyria are depicted on clay tablets dating from 2300 to 2100 B.C., now in the British Museum. At least as early as 1300 B.C. map making was common in Egypt, as at the time of Ramses II (Sesostris of the Greek historians, 1333–1300 B.C.) a survey and map of the country were made in view of the necessity of apportioning land and the readjustment of the boundaries after the Nile floods. In fact, under these conditions the pharaohs had virtually to maintain a land office. According to Herodotus, such early work was the origin of geometry and surveying, with consequent map construction. The oldest map extant is an Egyptian papyrus of the thirteenth century B.C. in which some Nubian gold mines are shown.

One of the first students of the world-wide geography was Thales of Miletus (624–543 B.C.); and Anaximander (610–546), his pupil, is credited by Strabo with making the first map of the world, while Diogenes Laertius states that not only did he make a map of earth and sea, but also constructed a globe. According to Agathemerus and Herodotus, Hecatæus (550–475) of Miletus, who had traveled extensively in Egypt, Persia, Libya, Spain, and Italy, improved, corrected, and greatly extended the map of Anaximander. Thales is reported to have divided the earth into five climatic zones, much as they are recognized to-day, though this is also ascribed both to the Pythagoreans and to Parmenides of Elea (544–430 B.C.), and the latter was said to be the first to assert that the earth was of spherical form and at the centre of the universe. It is probable that Thales was the first to use meridians on a map and possibly the first to draw the equator; he is credited with the discovery that the plane of the ecliptic is inclined to that of the equator and made a rough measurement of the inclination.

Up to the time of Thales, and even later, the world was considered as a plane. Thales, however, is said to have suggested the spherical shape of the earth, and this is probable if he was the originator of the climatic zones; but we are told by Aristotle and Plutarch that, inasmuch as his pupil Anaximander considered the earth to be a disk or a section of a cylinder resting in the centre of the hollow celestial sphere, it is doubtful if Thales held more correct views. Very soon afterward the Pythagorean school of philosophy, if not Pythagoras himself, taught that the earth was spherical, though this hypothesis was based more upon ideas of symmetry than upon known facts. The proof of the earth's sphericity was left to Aristotle (384–322), who drew this conclusion from the shadow of the earth cast upon the sun in eclipses, and though he made no maps of which we have record, he may be said to have founded scientific geography and map making.

Dicæarchus of Messina, a pupil of Aristotle, constructed maps of Hellas and is said to have estimated the size of the earth on an oval map of the world he constructed. He is supposed to have been the first to draw a parallel of latitude on a map, such a line having been derived and drawn on his map from observations of the length of the shadow cast by the sun.

The first attempt to measure the actual size of the earth was made by Eratosthenes (c.275–195), from whom scientific geography may be said to date. (See ERATOSTHENES.) Appointed keeper of the Alexandrian Library by Ptolemy Euergetes in 245, he started his map making by determining the difference in latitude between Alexandria and Syene by measuring the shadow of the sun as cast by a gnomon or pillar at each

place on the same day, and then after computation determined in linear measure the length of the corresponding arc of meridian. He determined the latitude of Alexandria, Syene, and Meroë, through which he traced his initial meridian. He obtained the distance between Alexandria and Syene from maps made by Egyptian royal surveyors, as 5000 stadia, which corresponded to one-fifth part of a circle. From the data thus obtained, he concluded that the length of a degree of latitude was about 700 stadia. Assuming the stadium to have been 164 meters (Dorpfeld), this would give the length of a degree as 114,800 meters (61.9453 modern geographical miles of 6080.20 feet), which is 3992 meters (2.154 geographical miles) in excess of its real value. This difference may have been due in part to the fact that Syene and Alexandria are not on the same meridian or longitude as Eratosthenes supposed; but there was established the earliest system of geographical coördinates which is fundamental to all accurate mapping, either in whole or in detail. Notwithstanding the error, this was an enormous step forward towards accuracy, and the map he prepared from information obtained in the great library was far superior to that of any predecessor.

Crates of Mallus, who died in 145 B.C., was the first to construct a globe which represented the views of the earth held by the Stoic school of philosophy. In this the symmetry ideas of the Pythagorean school are found carried still further. Since land exists on both sides of the equator, he concluded that the known continent of Europe, Asia, and Africa must be balanced by another on the opposite side of the world. The resulting globe had an equatorial ocean and a meridional one, the two dividing the world into four parts each containing an inhabited continent. On this globe the existence of such continents as North and South America and Australia was anticipated. As showing the effect of this arrangement in modes of thought it may be said that such a globe so divided by bands early became typical as one of the insignia of royalty.

Hipparchus of Rhodes (fl. c.160 B.C.) compiled no maps, but his labors in the field of geography, astronomy, and mathematics were most important and helpful to map making. On the strength of his astronomical knowledge he criticized the work of Eratosthenes, describing its defects and their remedies. He showed the desirability of constructing large maps upon a rectangular projection or plan where the feature of a curved or spherical surface was represented on a plane in such a way as not so greatly to distort the areas at equal distances, devising what are known in map making as the orthographic and stereographic projections, described later in this article. He placed at equal distances the meridians and parallels which Eratosthenes had arranged somewhat arbitrarily, and in order to secure accuracy he showed that the positions of places—both in latitude and longitude—should be determined astronomically; he also pointed out that longitude could be determined astronomically by the eclipses of the sun and moon, instead of being based merely on the itineraries or estimated or roughly measured distances of travelers and sailors, as had been done hitherto. Though he constructed no maps, Hipparchus made a celestial globe which was in the Alexandrian Library in the time of Marinus, 300 years later; and by considering the earth a sphere and dividing it by great circles perpendicular to the equator and extending to the poles, and by parallel lines at equal distances from the equator to the poles, he not only made geography possible as an exact science, but provided the introduction to modern ideas of latitude and longitude.

During this long period map making does not appear to have progressed, though Strabo (50 B.C.–24 A.D.) added considerably to geographical science and knowledge, and the campaigns of the Romans, of which rough itineraries or crude maps were prepared, gave much information in regard to regions previously unknown. A military map of the Roman provinces was made under the order of Julius Cæsar by three surveyors, who began their work in 44 B.C. and continued it for 25 years. Such military maps and the itineraries of travelers, however, must be considered at their face value, for they did not represent places in their relative distances, as would a map based on latitude and longitude. Thus, in the Peutingerian Table, a Roman *itineraria picta*, in one of the oldest surviving mediæval maps, now in the Royal Library in Vienna, there is seen a thirteenth-century copy of an old Roman original showing the Roman world at the time of Theodosius (393 A.D.). It is some 18 feet in length and more than 1 foot in breadth, embracing the region from Spain to India. See ITINERARY; PEUTINGERIAN TABLE.

But, returning to more scientific maps, mention next may be made of the work of Marinus of Tyre (c.120 A.D.), which is known from the description furnished by Ptolemy. Marinus, who studied the work of his predecessors and all other accumulated geographical data, was the first to determine the geographical positions of places on his map by using a projection or plan based on their latitudes and longitudes. This plan was not really a projection as understood by modern geographers, as it had the parallels and meridians equidistant and at right angles; and as the relative lengths of the degrees of latitude and longitude were based on a central parallel for which the latitude of Rhodes was taken, regions to the north and south naturally were distorted both in area and shape. The errors of this chart were even further increased by his adopting the length of a degree of latitude, 500 stadia, as determined by the Stoic geographer Posidonius, instead of accepting the more accurate determination of 700 stadia made by Eratosthenes.

Claudius Ptolemy of Alexandria (c.190–270 A.D.) was one of the greatest geographers, astronomers, mathematicians, and map makers of all times; and fortunately most of his work, both the maps and the indexes of places, has come down to us, but only in copies with doubtful authentication. His knowledge of geography, astronomy, and mathematics eminently fitted him for map making, which was one of the least of his achievements, important as it was. He made maps largely by compilation, editing the work of previous geographers and particularly correcting many errors of Marinus and to a large degree the distortion of his maps. He also furnished descriptions of them with tables of geographical positions of places, so that the maps could be reproduced by others having copies of the original data, and in fact this was done extensively.

Ptolemy was responsible for two projections —one a modified conical, where the parallels were

MAP

THE WORLD ACCORDING TO CLAUDIUS PTOLEMY, CIRCA A. D. 150

WORLD MAP FROM THE ULM EDITION OF PTOLEMY, 1492

LARGE WORLD MAP OF MERCATOR, 1569

The First Drawn on this Projection

From photographs by Edward Luther Stevenson, Ph. D.

curved and the meridians straight, and the other also a modified conical, but having both parallels and meridians curved—both being seen in his maps of the world. In the first projection he preserves the correct relations between latitude and longitude at the equator and the extreme northern limit of his chart (latitude of Thule or the Hebrides). In the second plan he preserves the correct relations at the northern (Thule, about 65 degrees north) and southern (Agisymba, 20 degrees south) limits, at the equator, and at the parallels of Moroë (about 15 degrees north) and Syene (about 25 degrees north). Ptolemy's small maps, 26 in number, according to the oldest extant edition of 1478, are drawn upon a simple rectangular projection, their moderate areas not requiring the curve of the meridians or parallels to secure adequate accuracy.

Ptolemy's maps as planned and executed by him were a great advance upon those of his predecessors, but unfortunately he, like Marinus, followed the estimates of Posidonius instead of the more exact measurements of Eratosthenes as to the size of the earth, using 500 stadia as the length of a degree of latitude instead of 700. The known world was therefore unduly expanded in longitude (and at some places in latitude) on Ptolemy's charts, the east coast of Asia being shown to extend so far to the eastward as to place it 9000 miles or less from the west coast of Europe. Ptolemy's work, after being neglected for centuries, was revived in the fifteenth century, and his maps were known, copied, and extended. These maps were known to and studied by Columbus, and the comparative shortness of the distance from Europe to Asia was one of the reasons which led him to believe he could successfully reach China by sailing westward. While Ptolemy's work was of great value at this time, yet mariners and geographers, aided by geographical discovery during the fifteenth and sixteenth centuries, realized that the errors were both fundamental and detailed, so that his authority became undermined with the development of the more modern cartography.

Soon after the death of Ptolemy there came an end to nearly all development of science in the Christian world. The Church at this time included in its domain science as well as all other forms of learning, and the fathers, such as St. Augustine, then such theologians as Thomas Aquinas and the popes regarded the Bible as the sole repository of wisdom, scientific as well as spiritual, and adhered blindly to a literal interpretation of its text. The bishops of Alexandria destroyed the rehabilitated Alexandrian Library and the Serapeum and scattered the priceless records of previous scientific achievement. For a thousand years now the intellectuality of the Christian peoples reverted to the beliefs antedating the rise of Greek philosophy; geography and map making suffered with other branches of science. The clear and intelligible maps and scientific methods of Ptolemy were neglected and forgotten for a thousand years, and instead there were put forth grotesque and fanciful representations of land and water which form all the commentary necessary as to the intellectual state of the times. Some were rectangular, some circular, all consisted of fancifully shaped land surrounded by the "circumfluent ocean." Many contained fantastic figures of princes and scriptural characters as well as legendary beasts and monsters. The map still in existence in the cathedral at Hereford, England, and dating from 1283, is interesting as indicating an increasing knowledge of geography at this time while still preserving many of the absurdities of the patristic period.

Thus the Christian world—not so the Mohammedan. As soon as the blind fanaticism and fury of their early conquests were spent, the various Mohammedan rulers encouraged science, literature, and commerce. They sought learning and philosophy wherever it was to be found, and much that has survived of the work of Aristotle, Ptolemy, and of other Greeks and Egyptian learned men has come down through them. Moreover, they developed and greatly improved and practicalized the science and information they received. Among the many things with which they dealt were charts and maps, which they made more correct and more common.

Among the most important developments of this period were the so-called compass maps which were attached to the portolani or books of sailing directions for mariners trading in the Mediterranean. The distinguishing feature of these charts was a great number of lines radiating from one or more centres. The exact use made of these lines is uncertain, but it may be that they served to show the general directions of places from each other. As they were drawn without regard to land and water, they did not show practicable routes for vessels; and as they seem to have been common before the introduction of the compass, they were not designed for use with it. The origin of the portolani charts is unknown, but they show that much advance had been made in accuracy of knowledge concerning latitude and longitude since the days of Ptolemy. Some of these charts were more ambitious and covered as much of the earth as was known, and we know that one by Toscanelli, made about 1474 on the basis of the travels of Marco Polo, was sent to Columbus.

The discovery of America aroused interest in science and secular learning and caused a general skepticism as to previously accepted facts and a distrust of the hitherto accepted ideas as to astronomy, cosmogony, and geography. For nearly 1500 years science and the Church had been in opposition, and naturally this extended to map making. The Spanish conquistadores found that the Peruvians had ordinary maps and maps in relief, while the Mexicans had cadastral plans of villages and towns and a map of the coast; but the Spanish Conquest put an end to all development in that part of the world.

The discovery of America, which continent first appeared in the Waldseemüller map of 1507 and in Ruysch's map of 1508, upset views as to the shape of the earth, but the Church allowed the facts to spread but slowly and opposed the ideas of Copernicus and Kepler, but the truth necessarily prevailed in time. The result was a great impetus towards exploration and map making. The works of Ptolemy, Hipparchus, and Eratosthenes were again considered, especially in view of the fundamental principles upon which the work was executed, and maps began to be constructed upon real projections and with more attention to collecting the results of explorations. The map of the world made by Gerhard Kremer (Mercator) in 1569 is by far the best produced up to that time. Its principal errors are the undue width of North America and an extension of the Antarctic continent too

far to the northward—so far indeed as to connect it to Australia, of which the southern coast was then unknown. Mercator's charts were engraved on copper and were among the first in which reproduction by this method was employed.

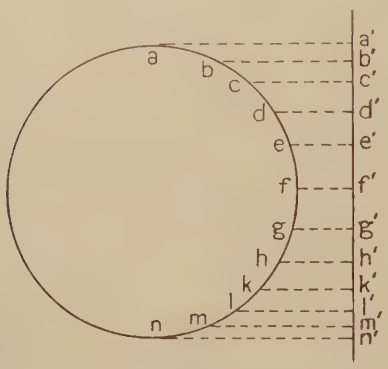


FIG. 1. ORTHOGRAPHIC PROJECTION.
Showing lines of projection.

Since the time of Mercator the development of map making has continued without a break, not only as regards scientific improvement of the projections and of the methods of reproduction but also as regards accuracy of delineation and of geographic positions, which has been rendered possible by the extension of geographic knowledge and the perfection of modern surveys. Map making has also been extended to cover geological, meteorological, and other terrestrial phenomena; to show elevations or depressions in the earth's surface by variations in color, contour lines, and maps in relief; and to exhibit by suitable means the mineralogical character of the earth's crust or its magnetic forces.

Most civilized countries now are quite accurately and more or less completely mapped on a large scale, the first attempt in this direction being made in 1733 by Cesar Cassini, the director of the astronomical observatory at Paris. Assisted at first by the French Academy of Sciences and afterward by a private company, he

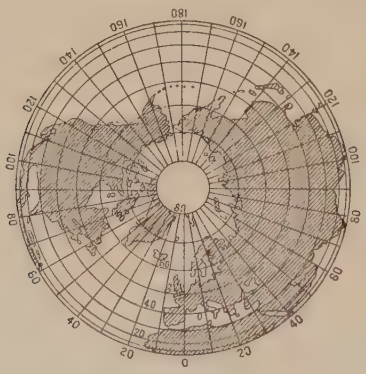


FIG. 2. ORTHOGRAPHIC PROJECTION.

undertook to map the entire area of France. The first sheets appeared in 1744 and the last were completed in 1793. The work aroused widespread interest in all civilized countries and so forcibly illustrated the value of accurate maps that the French government undertook an elaborate survey, an example that has been generally followed in Europe and America. In the United States the map-making establishments are the Geological Survey (q.v.), which is bringing out topographical and geological maps of the whole country, the Coast and Geodetic Survey (q.v.),

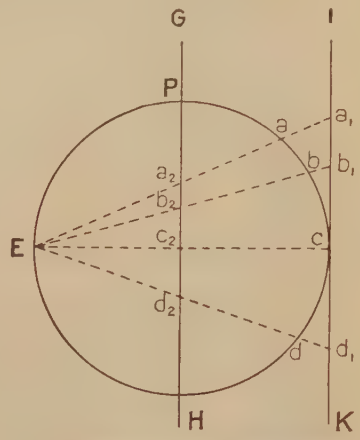


FIG. 3. STEREOGRAPHIC PROJECTION.
On the plane of a meridian and on a tangent plane, showing lines of projection.

which publishes charts of the coast and harbors, and the Hydrographic Office (q.v.) of the Navy, which publishes charts of the Great Lakes and of the oceans, coasts, and harbors of the world beyond the limits of the United States.

The number of types of projection used in the official and private maps of the different countries, as well as the difference in scales, nomenclature, symbols, character of information presented, etc., has caused much trouble to geographers, map makers, engineers, educators, and others throughout the world. Several international conferences have been called to consider the various geographic and constructional questions of general interest. The conference of 1909 took place in London. The United States and the principal European nations were represented. Among other matters decided upon was the con-

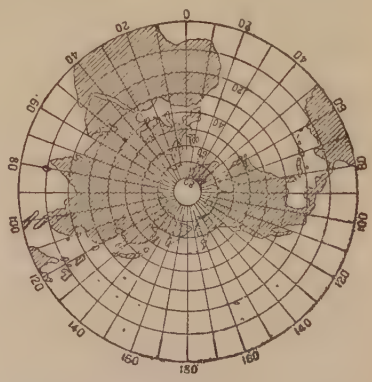


FIG. 4. STEREOGRAPHIC PROJECTION.

struction of an international map of the world on a uniform scale, each nation mapping its own areas.

This map is to be prepared on a modified polyconic projection (hereinafter described) with a scale of 1 in 1,000,000 (about 16 statute miles to the inch) and will be made up of sheets cov-

1

2

1. HEREFORD WORLD MAP, 1283. A typical mediæval map on which are shown scriptural allusions as well as geographical myths and fables. It is preserved at Hereford Cathedral, England.

2. PEUTINGER TABLE A Thirteenth Century copy of an old Roman itinerary or road map. The upper section shows Italy, etc., and the lower the Balkan Peninsula, Rome, and Constantinople. This map is in the Royal Library, Vienna.

From photographs by Edward Luther Stevenson, Ph.D.

PORTOLAN CHART BY BARTOLEMEO OLIVES, 1552

From a photograph by Edward Luther Stevenson, Ph. D

ering 6° of longitude and 4° of latitude. The sheet containing New York City (40° to 44° N., 72° to 78° W.) is about 17.5 by 20 inches exclusive of border. By trimming off the border the sheets may be joined to form a large map covering any

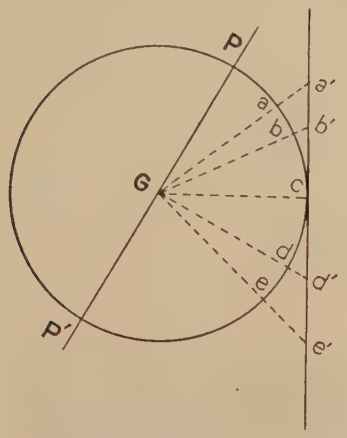


FIG. 5. GNOMONIC OR CENTRAL PROJECTION.
On a plane tangent at lat. 30° N., showing lines of projection.

desired area. The work is in progress in all countries which were represented at the conference and in some others which have since acceded to the plans. It was hoped that the map would be completed about 1920.

Relief maps are frequently made to show the topographical features of a country, district, watershed, canal, river, mountain range, etc. If the scale is small the altitudes are usually exaggerated in order to give a clearer appreciation of details. When the scale is large this is not so necessary. Some relief globes have been made, but they are not common except for instruction of the blind.

Theory of Map Construction. As the earth is a spheroid, it is impossible exactly to represent it, or even a small portion of it, upon a plane surface. In order to represent parts of it upon

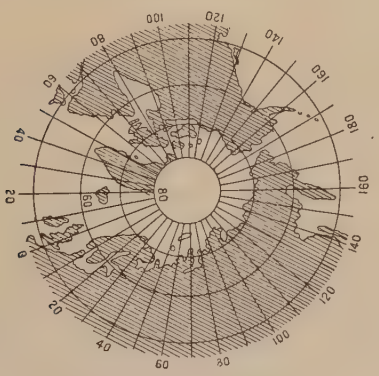


FIG. 6. GNOMONIC PROJECTION.
On plane tangent at the pole.

a plane with as little distortion as practicable, maps are prepared according to various systems of construction called projections. There are three classes of maps: (1) those made by perspective projection upon a plane, (2) those perspectively projected upon a curved surface of single curvature, such as a cone or cylinder, and the resulting projection developed (i.e., rolled out) upon a plane, and (3) arbitrary constructions. All are commonly termed projections, though only the first has any right to the designation (and even that is not a normal projection), while the third has no real claim to the title.

Projections of the first class may be divided into three groups—internal, surface, and external—depending upon the position of the point of sight, which may be inside, on the surface of, or outside the sphere. The only internal projection of importance is the gnomonic, and the only surface projection is the stereographic. The external projections are the orthographic, globular, Clarke's, James's, La Hire's, Parent's, etc. The developed projections are the simple conical and the cylindrical. Mercator's is sometimes placed in this class, but this is incorrect. The arbitrary constructions include Mercator's and a vast number of others designed for various uses.

In the central or gnomonic projection the eye

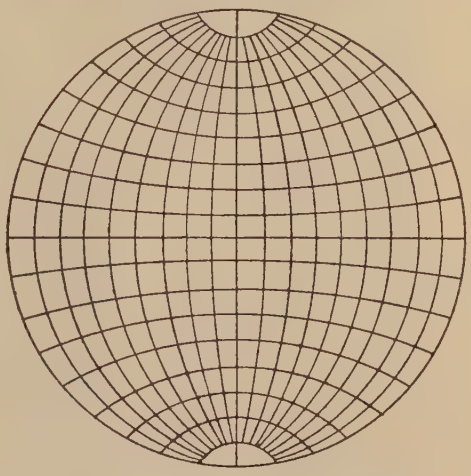


FIG. 7. GLOBULAR PROJECTION.
Showing meridians and parallels of latitude 10° apart.

is supposed to be at the centre of the earth and the plane of projection tangent to the surface—usually at the equator or about 30° north or south latitude. As the planes of all great circles pass through the centre of the sphere, they are projected as straight lines. All lines of sight on the earth and the path of the shortest distance between two points are shown as straight lines. Within 3° from the point of tangency of the projecting plane both distances and angles are quite accurately projected, but beyond 3° the errors increase rapidly. At 60° from that point the distortion is very great. This projection is suitable for surveying sheets and maps of moderate area and for charts of large area designed to give great-circle courses, tracks, and distances. See NAVIGATION.

In the stereographic projection the eye may be placed at any point in the surface of the sphere; the projection is made on any plane perpendicular to the diameter passing through the eye. The usual planes are the one which is tangent to the sphere at the opposite end of the diameter and the plane of the great circle of which the eye is the pole. In a sphere both

angles and shapes are projected in their true form, but in a spheroid this is not so, and the difficulties connected with the computations have prevented extensive employment of this projection in exact mapping of the earth.

The external projections are numerous, as there are certain advantages to be gained by selecting particular distances beyond the surface for the point of sight. The type most commonly used is the orthographic in which the eye is assumed to be at an infinite distance and the projecting lines are parallel and perpendicular to the plane. In Clarke's projection the distance of the point of sight is variable and is adjusted to the area in such a manner as to give the minimum deformation. In Parent's projections the distances from the centre of the sphere are 1.595 and 1.732 times the radius, while in La Hire's the distance is 1.707 times and in James's 1.5 times.

The developed projections are the simple conical and the cylindrical. In the conical the cone is tangent to the earth along some circle of latitude and the projection is perspective with the eye at the centre of the earth or where the normal cuts the minor axis. After receiving the projection the imaginary cone is supposed to be cut along one of its elements and rolled out flat upon the paper. The meridians are evidently straight lines and the parallels concentric circles. Near the circle of tangency the distortion is small, but it rapidly increases beyond a distance of 3° in latitude. In the cylindrical projection the points on the earth's surface are projected upon the cylinder by normals to the common diameter of the sphere and cylinder. The cylinder is supposed to be cut open along an element and rolled out flat on a plane. Cylindrical projections are also made perspectively with the eye at the centre of the sphere. The Mercator is popularly supposed to be developed in this way, but that is not so.

The arbitrarily constructed projections are the ones most commonly used. The different forms are designed to afford certain advantages —equivalent areas, similar shapes, equal angles, equal distances, great-circle routes, simplicity of construction, minimum errors of area, shape, angles, distances, etc., suitability for surveying purposes, for navigation, for representation of large areas, etc. Projections in which very small figures, angles, etc., are represented in the same shape as on the earth are called orthomorphic; those in which equal areas of the sphere are shown as equal (but perhaps slightly deformed) areas in the projection are called equivalent or equal-area projections; equidistant projections are those in which the distances, measured in certain directions, are the same as on the sphere.

The simplest form of the arbitrary projection is the ordinary globular. In a hemisphere on this projection the boundary is a great circle; the equator and central meridian are shown as straight lines. The other meridians are arcs of circles passing through the poles and cutting the equator at equidistant points; and the parallels of latitude are arcs of circles which divide the bounding meridian and the central meridian into the same number of equal parts.

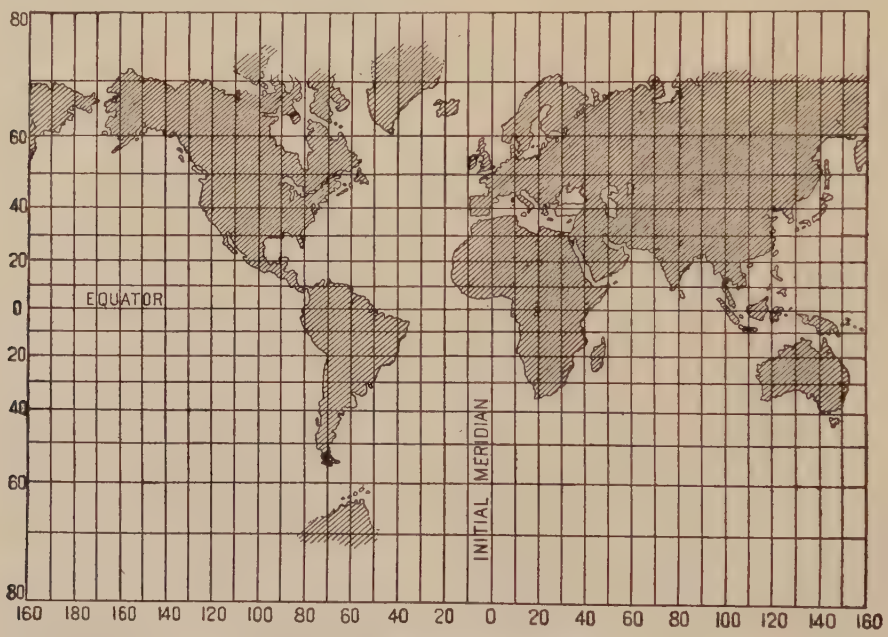


Fig. 8. A Mercator's projection.

Nearly all the other arbitrary projections of importance make use of an imaginary cone or cones in the construction, or may be regarded as modifications of conical projections. In the true conical projections the meridians are straight lines and the parallels are arcs of circles. In the polyconic the central meridian and equator are straight, other parallels and meridians are curved. In the modified conical either the meridians or the parallels are curved or they are both curved.

The most important of all projections is the Mercator. It may be regarded as constructed upon a cone of definite base (the equatorial great circle) and infinite altitude—in other words, a cylinder. The popular idea of this projection is that it is of the perspective type,

projected upon a cylinder tangent to the earth at the equator, the eye being at the centre of the earth; and that the projection so formed is developed by cutting along a meridian and rolling it out upon a plane surface. Such is not the case. The total extension of the meridian from 0° to 60° of latitude is only about 25 instead of 65 per cent as given by a perspective projection.

In sailing upon a fixed compass course this course necessarily cuts all meridians at a constant angle. The path of a ship so steered is not a straight line but a curve called a *rhumb line*. (See SAILINGS.) The rhumb line joining two points never exactly coincides with the great circle passing through them except when they are both on the equator or both on a meridian. The divergence between the two increases rapidly with the increase of difference of longitude between the points and with the mean latitude. When the points are 180° apart the great circle evidently passes through the nearest pole and it always lies nearer the pole than the rhumb line. As the rhumb line cuts all meridians at a constant angle, it can only be represented as a straight line on a plane surface when the meridians are represented as straight lines and are parallel to each other; and the angle on the plane can only be equal to that of the sphere or spheroid when the projected latitudes are progressively increased so that the relation between the lengths of a minute of latitude and a minute of longitude at any point of a sphere is the same as that existing between similar lengths on the map.

If x is the distance (on the map) from the equator to any parallel of latitude L; and if R is the equatorial radius of the earth, M the modulus of common logarithms, and e the earth's eccentricity, then $x = \frac{R}{M} \log \tan (45° + \frac{1}{2}L) - R(e^2 \sin L - \frac{1}{3}e^4 \sin^3 L + \frac{1}{5}e^6 \sin^5 L \ldots)$.

For the sphere e becomes zero and the second term disappears. To express x in terms of minutes of equatorial longitude, substitute $R = 3437.74677$ and $\frac{1}{M} = 2.30258$. Tables showing the value of x for every degree and minute of latitude are published by the United States Navy Department. While the Mercator projection is invaluable for navigating charts it is not well adapted for charts of large areas except when the extent of latitude is moderate or when no part of the area is more than 30° from the equator. In charts of the world or of a hemisphere the relative exaggeration of areas beyond 45° of latitude is so great as to give very wrong ideas as to their extent.

The polyconic projection is quite largely used for surveying sheets and by the United States Coast Survey for nautical charts. For purposes of navigation these charts are not nearly so convenient as those on Mercator's projection, because the ship's track is not a straight line and charts of the same scale and latitude do not match at the edges. The polyconic projection is quite accurate as to distances, angles, and areas within 3° of longitude from the central meridian; beyond 60° of latitude its accuracy is fair throughout. The method of construction assumes a series of cones tangent to the sphere at equidistant parallels of latitude. These cones are rolled out both ways from the central meridian, each base forming a circle with the slant height of the cone as a radius. The successive bases form the parallels of latitude. On these the correct longitude is laid off from the central meridian and the points on adjacent parallels joined to form the other meridians.

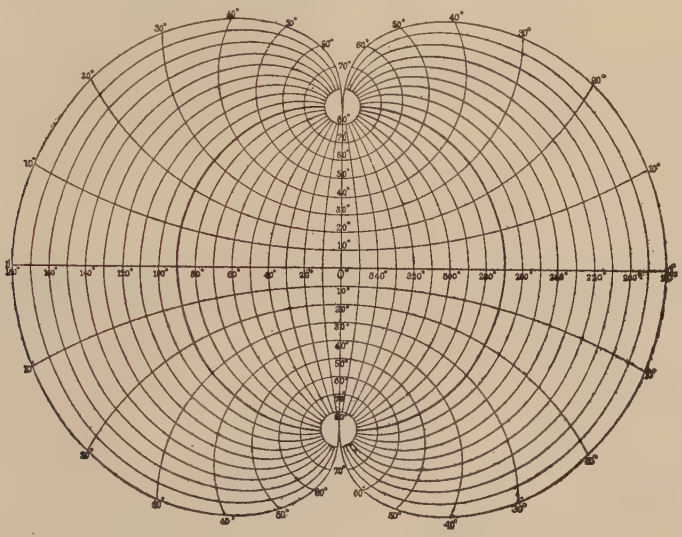


FIG. 9. POLYCONIC PROJECTION.

One of the most useful projections is the orthomorphic conical projection with two standard parallels. This was devised by Lambert, but is commonly attributed to Gauss. It is of the simple conical type in which all the meridians meet at a point beyond the limits of the map. The correct meridional lengths are laid off along the central meridian. The parallels are circular arcs of large radius. Two parallels (at about one-sixth the total length of the chart in latitude from top and bottom) are selected as standards. The correct spheroidal lengths are laid off on these parallels and the meridians drawn through corresponding points. The other parallels are arcs of circles having the same centre, pass through the correct latitude points on the central meridian, and therefore intercept

the correct lengths on all meridians. This projection is well suited to the representation of the whole northern or southern hemisphere on a single sheet, and is very correct as regards areas, angles, shapes, and distances for a range of 40° in latitude and fairly so for a range of

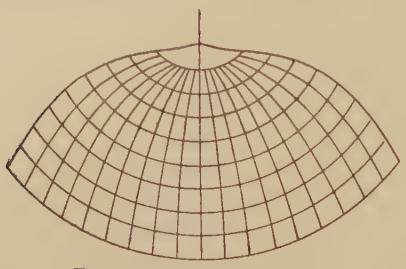


FIG. 10. BONNE'S PROJECTION.
Lat. 90°, long. 180°.

60°. It is particularly well suited for maps of smaller areas.

If for *two* standard parallels we substitute *one*, we get the simple conical projection. This has no particular merits, its range of accuracy being confined to a narrow belt of latitude on each side of the standard parallel.

Bonne's projection is much used in geographies and atlases. It is a modified conical. The central meridian is a straight line on which are laid off the correct spheroidal distances between parallels. The parallels are arcs of concentric circles. One of them is selected as the standard and this is struck with a radius of $p \cot L$, in which p is the length of the normal to a meridian (which is an ellipse) intercepted between the circumference and the minor (polar of the sphere) axis and L is the latitude of the parallel. The other parallels are struck with the same centre and intercept correct intervals of latitude on the central meridian. On each parallel are marked the correct distances between meridians as derived from the spheroid. The

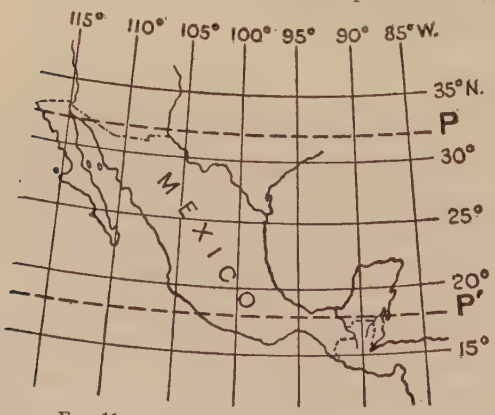


FIG. 11. MEXICO ON A CONICAL PROJECTION.
With rectified meridians and two standard parallels.

corresponding points are connected to form the meridians of the map. Bonne's projection is an improvement of one of Ptolemy's. It is an equal-area projection and is suitable for maps of not more than 120° of longitude and on one side of the equator; beyond 60° from the central meridian the distortion of shapes is considerable.

The sinusoidal or Flamsteed's projection is similar to Bonne's in construction except that the parallels are straight lines perpendicular to the central meridian. It also is an equal-area projection. It is suitable for a map of 180° of latitude and 120° of longitude; indeed it is probably the best of all projections for showing a hemisphere. No projection can show the whole world in a continuous projection without enormous distortion of polar areas.

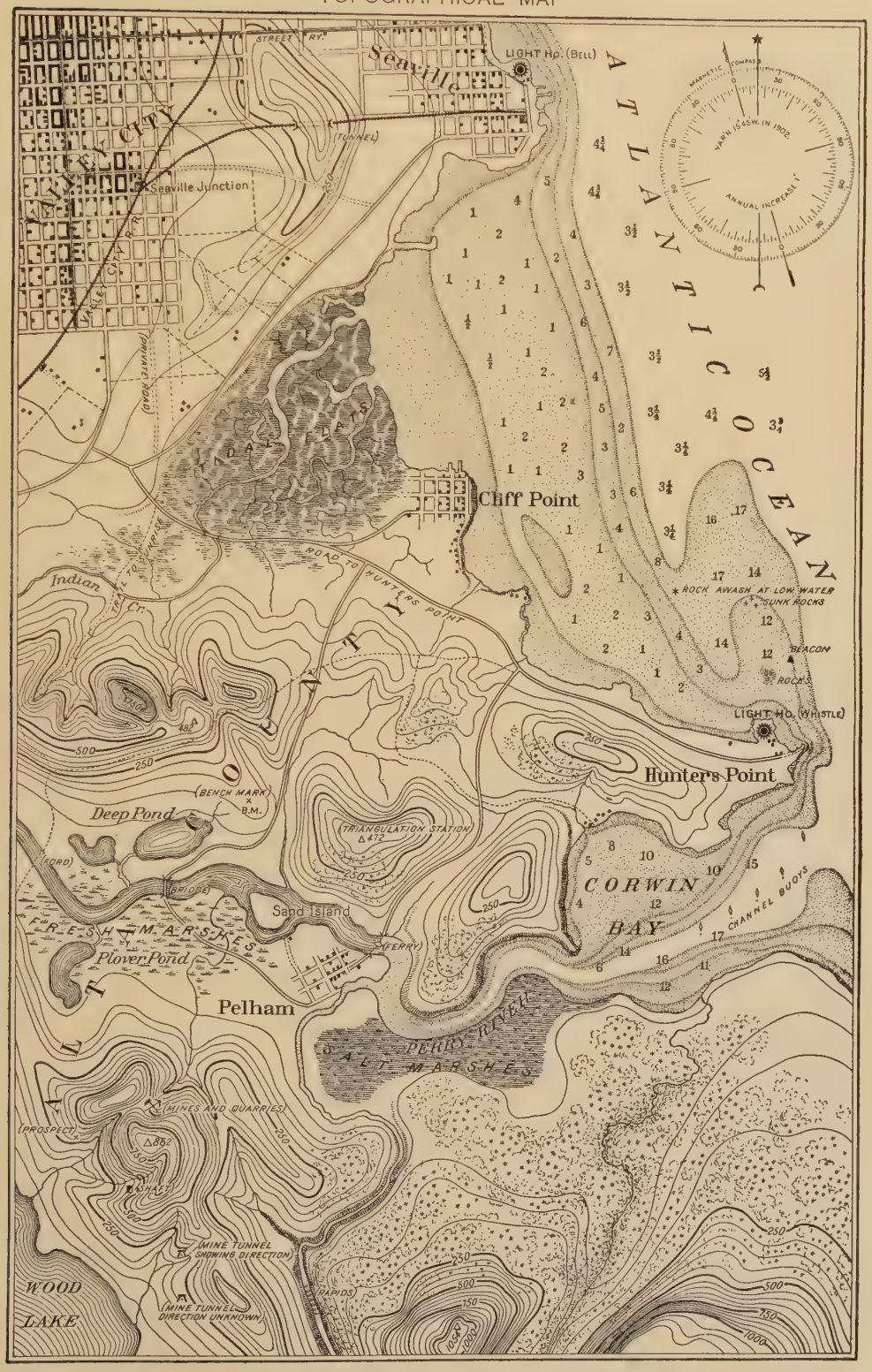
Zenithal projections may be perspective (all perspective projections are zenithal) or arbitrary. A point is selected for the centre of the map. All planes passing through this centre and the centre of the sphere cut straight lines in the projection and great circles in the sphere. The points of the sphere are laid out on the corresponding lines of the projection at distances depending upon the law of the particular projection. If perspectively, with the eye at the centre, we get the gnomonic; if the eye is in the opposite surface, the stereographic. Aside from these and other zenithal projections already described or mentioned, only two are very useful. One is the *equidistant zenithal* and the other the *equal-area zenithal*. In the equidistant zenithal the true lengths of the spheroidal arcs are laid off on the corresponding lines of the projection; in the other the lengths are so proportioned as to give equal areas. A third projection is Airy's, in which the errors of distance, shape, and direction are balanced so as to make them as small as possible in each direction without increasing them unduly in others. Zenithal projections are adapted to the representation of fairly large areas in any part of the world, but are chiefly (except as regards the gnomonic) employed in polar charts.

The projection selected for the International Map of the World is a modified polyconic. Each sheet is plotted independently on its central meridian, which is a straight line marked off in degrees in a manner hereinafter explained. Through the points so marked circles are drawn to represent the parallels. The centres of the circles are on the prolongation of the central meridian, and the radius of each circle is $N \cot L$, in which N is the length of the normal intercepted between the curve and the minor (polar) axis of the meridional ellipse and L is the latitude of the parallel represented. Along the limiting parallels of each sheet (i.e., the circles at the top and bottom) the degrees of longitude are laid off in their true length to scale. Corresponding longitude points on the limiting parallels are joined by straight lines which represent the meridians. The meridians which are true to scale are those which are 2° to the east and west of the central meridian. The actual lengths on the central meridian are true to scale minus the small correction necessary to effect the adjustment, and this is given in a special table.

Practical Construction. The surveys (see SURVEYING; HYDROGRAPHY) having been completed, the results are transferred to the base map on a suitable projection; errors and discrepancies are eliminated or reconciled, and if certain localities need additional examination this is made. From the base maps and the original data drawings for the final map are prepared on the predetermined scale. In some cases it is practicable to obtain the suitable working plans by photo reduction from the base maps.

To facilitate projection of points, areas, me-

TOPOGRAPHICAL MAP



Scale: 1 ½ 0 1 2 3 Miles.
1 ½ 0 1 2 3 4 Kilometers.

RELIEF: Figures indicate heights in feet above datum.

(Contour interval 50 feet.) *Datum is mean sea level.*

HYDROGRAPHY: Figures over dotted areas show depths in feet, others in fathoms.

ridians, parallels, etc., tables have been prepared for all the principal projections, and these obviate the necessity for computation. After the working drawing is completed the maps or charts are prepared for reproduction by engraving them on plates, etching them on plates, or by photolithography. The engraved plates (copper or soft steel) give the best results, but are more costly; the etched plates are prepared by photographing on copper plates and etching with acid. The photolithographed charts are by far the cheapest, but are necessarily printed on inferior paper and will not stand much use.

The map shown upon the accompanying plate has been designed to illustrate the methods of delineation employed by the Coast and Geodetic Survey, the Geological Survey, and the Hydrographic Office of the Navy. The Geological Survey maps give certain additional data, as do some of the charts published by the Hydrographic Office.

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MAP, or MAPES, WALTER. A mediæval author, of Welsh descent, born probably in Herefordshire, England, about 1140. He studied in Paris from about 1154; was connected with the household of Henry II, whom he attended abroad; was sent on missions to Paris (1173) and Rome (1179); and was precentor of Lincoln, incumbent of Westbury, Gloucestershire, prebend of St. Paul's, and Archdeacon of Oxford (1197). He died about 1209. Map's one undoubted work is *De Nugis Curialium* (The Triflings of Courtiers), a curious and interesting medley of anecdotes, reminiscences, and stories, to which we owe most of our knowledge of Map's life. In several of the manuscripts of the prose *Lancelot, Grail,* and *Morte d'Arthur* his name occurs as the author. But recent scholarship places them at a later date. With some doubt the Golias poems are ascribed to him, satires in Latin on the clergy. Map was especially a foe of Jews and Cistercians. In this collection occurs the famous drinking song "Mihi est propositum in taberna mori," which was rendered into English by Leigh Hunt. Consult the *Latin Poems Attributed to Map* and *De Nugis Curialium,* edited by Wright, Camden Society (London, 1841, 1850), and Bardoux, *De Waltherio Mappio* (Paris, 1900).

MA'PLE (AS. *mapol, mapul, mœpel,* Icel. *mopurr,* OHG. *mazzaltra, mazzoltra,* Ger. *Masholder,* maple), *Acer.* A genus of trees of the family Aceraceæ, containing nearly 100 species, natives of north-temperate regions, especially abundant in North America and eastern Asia. They have opposite, lobed, or palmate leaves without stipules; flowers in small axillary racemes or corymbs, rich in nectar, and attractive to bees; fruits, two small winged nuts, one or two seeded. With a few exceptions the entire order is embraced in the genus *Acer.* The best-known European species are *Acer campestre* and

MAPLE LEAVES.

1, European maple (*Acer campestre*); 2, striped maple (*Acer pennsylvanicum*); 3, sugar maple (*Acer saccharum*); 4, cut-leaved form of Japanese maple (*Acer japonicum,* var. *dissectum*).

Acer pseudo-platanus. The common maple (*Acer campestre*), a shrub or small tree seldom attaining a height of 50 feet, is a native of many parts of Europe and Asia. Its wood is hard, fine-grained, takes a high polish, and is much used by turners and for carved work. The greater maple, sycamore, or plane tree of Europe (*Acer pseudo-platanus*) is extensively planted both in Europe and in America. It is a large tree with a spreading head, 70 to 90 feet tall, of rather

quick, vigorous growth. Its wood, which is white, compact, moderately hard, receives a fine polish and is much used by wheelwrights, turners, etc. Sugar is sometimes made from the sap.

The Norway maple (*Acer platanoides*), a native of Europe, is commonly planted in the eastern United States and elsewhere as a shade tree. It grows to a height of 100 feet and has a compact, round head that renders the shade very dense. It is by some preferred as a shade tree to the sugar maple, which it resembles.

RED MAPLE.
a, staminate flowers; *b*, pistillate flowers.

Among the American species perhaps the best known is the sugar maple (*Acer saccharum*), a large tree, 90 to 120 feet high, and found from Newfoundland to Georgia and westward to the northern shores of the Great Lakes, eastern Nebraska, and Kansas. The wood has a satiny appearance and is extensively used in cabinetwork and finishing houses. When the grain has a pronounced wavy appearance the wood is called bird's-eye maple and is used as veneer. From the sap of this tree large quantities of sirup and sugar are made. To obtain the sap, holes are bored into the tree for half an inch or more in the late winter or early spring. The sap, caught in vessels, is evaporated until the residue becomes sirupy or until a yellowish or brown sugar is obtained. Trees will yield from two to six pounds of sugar during a season, and if the tapping, as it is called, is properly done, the tree suffers little injury. The black maple (*Acer nigrum*), now regarded as a variety of *Acer saccharum*, is also an abundant producer of sugar. The tree is of similar habit and range to the former, and is distinguished from it by its black bark and generally duller appearance. The silver maple (*Acer saccharinum*, formerly known as *Acer dasycarpum*) is a large, rapidly growing tree of the same range as the last. It is an ornamental tree, with light, brittle wood, and is extensively planted as a shade tree, but, aside from its rapid growth, is not equal in this respect to the sugar maple. The tree is very

RED MAPLE (*Acer rubrum*).
Spray with fruits.

hardy and easily grown, but on account of its brittleness is especially liable to damage by winds and storms breaking its limbs. This species was named *Acer saccharinum* by Linnæus under the impression that it was the true sugar maple, a tree which it is now believed he never saw. Sugar is made from it, but the sap is less sweet than that of either of the two species most commonly tapped. The striped maple (*Acer pennsylvanicum*) is a small tree with greenish bark striped with white lines. Its compact habit of growth and large leaves make it an excellent shade tree. The red maple (*Acer rubrum*) has about the same range as the sugar maple. It somewhat resembles the silver maple in habit, but is of slower growth. Its timber is valuable, and the spring coloring of the flowers and fruits and the autumn coloring of the leaves make it a very ornamental tree. The mountain maple (*Acer spicatum*), a small tree in the eastern United States, the large-toothed or Oregon maple (*Acer grandidentata*), and the vine maple (*Acer circinnatum*) of the Rocky Mountains and Pacific coast are other common and well-known species possessing the habits and uses described above. All of the species are valuable for fuel, in this respect exceeding all other woods except hickory in popular estimation. Of many of the species there are numerous cultivated varieties differing in their habit of growth, color and character of foliage, etc. The autumn coloring of the maples, especially in the United States, is not surpassed by any other group of trees, the reds and yellows of their leaves adding greatly to the beauty of the autumn landscape.

Among the species of eastern Asia are a number that have been introduced into western countries, and some have proved valuable for planting, such as the famous Japanese maples, most of which are varieties of *Acer palmatum* and *Acer japonicum*. They are mostly small trees or shrubs, and on account of their great variety in color and the deep and often curious lobing of their leaves, they are extensively planted as ornamentals.

One section of the genus *Acer*, sometimes called ash-leaved maples, have compound leaves. There are representatives of this group in Japan and in the United States, the best known of which is *Acer negundo* (*Negundo aceroides*), the box elder (q.v.), coming to be a very common shade tree along streets.

MAPLE, FLOWERING. See ABUTILON.

MAPLE, SIR JOHN BLUNDELL, BARONET (1845–1903). An English capitalist. He was educated at Crawford College and at King's College School. In 1862 he entered his father's furniture business, of which he was practically the head after 1880. The firm developed rapidly, and in 1891 it was changed into a limited liability company with £2,000,000 capital. Maple was a Conservative member of Parliament for Dulwich from 1887 until his death; was knighted in 1892; and was created Baronet in 1897. The owner of a large stud of blooded race horses, he won 544 races in 21 years with his entries, many of which were made under the name of "Mr. Childwick." He rebuilt University College Hospital, London, and left a fortune of £2,153,000.

MAPLE INSECTS. The different species of maple are greatly subject to the attacks of injurious insects, certain species, such as the silver-leaved maple, being more susceptible than others. Several insects bore in the trunks of these trees. The sugar-maple borer (*Glycobius speciosus*), a black, long-horned beetle which has yellow bands, destroys the sugar maple in the northern parts of the United States; the horntail borer (see HORNTAIL) and the larva of a clear-winged moth (*Ægeria acerni*) also bore

SUGAR MAPLE (Acer saccharinum).

1. Tree In Bloom.

2. Tree In Full Leaf.

the trunks, the latter being especially abundant in the Mississippi valley. A buprestid beetle, *Dicerca divaricata*, in the larval stage bores in red-maple stumps, although undoubtedly originally an enemy of the beech. The principal bark borer of the sugar maple in the northern United States is *Corthylus punctatissimus*, one of the Scolytidæ. The striped maple worm (larva of *Anisota rubicunda*) is a widespread enemy of these trees, frequently feeding upon the leaves in such great numbers as entirely to defoliate long rows of shade trees. The tent caterpillar of the forest (*Malacosoma disstria*) is a decided enemy of all species of maples and has greatly damaged the sugar maples in New York and New England. The tussock moth's caterpillar (*Orgyia leucostigma*) and the fall webworm (*Hyphantria cunea*) frequently defoliate the shade trees of the larger cities. The cottony maple scale (*Pulvinaria innumerabilis*) is occasionally so numerous as to cause serious injury, and another scale insect (*Pseudococcus aceris*), probably introduced from Europe, is very abundant on the shade trees of certain cities. The so-called gloomy scale (*Aspidiotus tenebricosus*) has a southern range, and is frequently the unnoticed cause of the death of otherwise vigorous shade trees. Several species of plant lice, notably *Pemphigus acerifolii*, damage the leaves of early summer, and a gall mite (*Phytoptus quadripes*) disfigures the leaves with its massed reddish galls. Consult A. S. Packard, *Fifth Report of the United States Entomological Commission* (Washington, 1890), and publications of the United States Bureau of Entomology, especially the *Circulars* (ib., 1900 et seq.).

MAPLESON, mā'p'l-son, James Henry (1829–1901). An English operatic impresario, born in London. He studied the violin for two years at the Royal Academy of Music and then went to Italy for singing lessons; but soon after his return a throat affection made a vocal career out of the question, and he was engaged in the orchestra at Her Majesty's Theatre. After having made tours with several leading artists, in 1861 he succeeded E. T. Smith as manager of the Italian opera at the Lyceum in London. He controlled Her Majesty's Theatre (1862–69), and then went to Drury Lane until 1877, when he returned to Her Majesty's, and the following year he brought Italian opera to the United States. He was successor to Strakosch at the Academy of Music in New York City and introduced many of the greatest singers of his time to New York audiences. In 1888 he published his reminiscences in two volumes under the title *The Mapleson Memoirs* (Chicago).

MA'PLE SUGAR. See Sugar.

MAPLEWOOD. A city in St. Louis Co., Mo., adjoining the city of St. Louis on the west, and served by the Missouri Pacific Railroad. It is essentially a residential suburb of St. Louis. Pop., 1910, 4976.

MAPS AND MAPPING. See Geodesy; Map.

MAP TURTLE. One of the names of a common North American land turtle (*Malaco-clemmys geographicus*), also called geographic tortoise.

MAPU, mä'pōō, Abraham (1808–67). A Russian Hebrew novelist. He was born in a suburb of Kovno and achieved a reputation as a Talmudist by the time he was 12. A Latin psalter falling into his hands, he set about studying Latin with intense interest, and under the guidance of a friendly Polish curate made rapid progress. This opened the way for the study of the Latin classics, which left an indelible impression on Mapu's poetic nature. A knowledge of French, which he acquired next, introduced him to the French romanticists, with whose works—and especially the novels of Eugène Sue—he became infatuated. In 1848, having secured an appointment as teacher in a Jewish government school in Kovno, he came in touch with Senior Sachs, who inspired him with new enthusiasm for Hebrew literature and urged him to devote himself to it. The result of this advice and encouragement was the completion of a novel, *Ahabat Zéyon* (The Love of Zion) (1852), conceived some 20 years before. As this historical romance was the first of its kind in Hebrew literature, its importance cannot be overestimated. It recalls in glowing colors the golden age of ancient Judæa. In spite of its puerile technique and crude psychology this work had an immense success. While strictly orthodox rabbis condemned *The Love of Zion* as a profanation of the holy language, their students everywhere were entranced by its poetry and sentiment. Mapu's next work, *The Transgression of Samaria* (1865), is another historical romance dealing with the same period as the first and written in noble biblical style. Both have been translated, under various titles, into German, English, and Yiddish. A third historical romance was all but destroyed by the Russian censorship. Mapu's last and longest novel, *The Hypocrite* (1859–69), fell far short artistically of the earlier ones. Besides these, Mapu wrote also an excellent manual of Hebrew (containing suggestions for teaching it), a Hebrew grammar, and a Hebrew textbook for the study of French.

MAPURITO, mä'pōō-rē'tō. See Conepate; Skunk.

MAQUET, mȧ'kȧ', Auguste (1813–88). A French author, born in Paris. He was educated at the Collège Charlemagne, where he was for a time teacher. Having written the drama *Bathilde*, he was introduced to Alexandre Dumas, who, impressed by his talent, proposed their working together. It has generally been admitted that in this capacity of collaborator he furnished large portions of Dumas's most famous books and plays. Under his own name he published the romances *Beau d'Angennes* (1843), *La belle Gabrielle* (1853–55), and many others. For the theatre he prepared *Le château de Grantier* (1852), *Le comte de Lavernie* (1855), *La belle Gabrielle* (1857), and a number of others.

MAQUI, mä'kwē (Sp. *maqui*, from the Chilean name), *Aristotelia macqui*. One of a few species of a genus of plants sometimes referred to the family Elæocarpaceæ, a Chilean evergreen or subevergreen shrub of considerable size. The small green or yellow flowers, borne in axillary racemes, are followed by three-celled edible black acid berries about the size of peas, which are used by the Chileans to make wine. The wood is used for making musical instruments, and the tough bark for instrument strings. The maqui is frequently cultivated as an ornamental shrub, and in favorable conditions sometimes bears fruit in northern countries.

MAQUI. A peculiar type of xerophytic thicket characteristic of the Mediterranean region of Europe. The plants are chiefly evergreen shrubs and half shrubs and comprise a

large number of well-known plants, such as the myrtle, box, laurel, and oleander. It is similar in appearance to the *chaparral* found in the southeastern United States, which is composed of dwarf evergreen oaks together with various shrubs of the buckthorn and rose families. See THICKET; CHAPARRAL.

MAQUOKETA, mȧ-kō′kē-tȧ. A city and the county seat of Jackson Co., Iowa, 38 miles by rail northwest of Clinton, on the Maquoketa River and on the Chicago and Northwestern and the Chicago, Milwaukee, and St. Paul railroads (Map: Iowa, G 2). It has a Boardman reference and a Carnegie library, a sanitarium, and Ellisonian Institute. Maquoketa is a trade and industrial centre of considerable importance, its manufactures including lime, flour, foundry and machine-shop products, brick, lumber, cigars, butter tubs, etc. In the vicinity are valuable quarries of limestone. The water works are owned and operated by the municipality. Pop., 1900, 3777; 1910, 3570.

MAR, EARL OF. See ERSKINE, JOHN (1675–1732).

MARA, mä′rȧ, GERTRUDE ELIZABETH SCHMELING (1749–1833). A German singer, born at Cassel. She began to play the violin at such an early age that her father, a poor musician, gave her a few lessons and then exhibited her as a prodigy in Vienna and London. In the latter city she took a few singing lessons from Paradisi and was so successful that thereafter she devoted herself entirely to vocalization. Her first engagement was at Leipzig; she then sang at the Dresden Court Opera, and in 1771 accepted an engagement for life at the Berlin Court Opera. In Berlin she married the violoncellist Mara, who squandered her fortune. In 1780, owing to a series of annoyances, she broke her contract and went to Vienna, and from there, in 1782, to Paris, where her great rivalry with Todi (q.v.) became an historic event, and the French public was divided into "Maradists" and "Todists." With the exception of two visits to Italy, she spent the period from 1784 to 1802 in England. Upon leaving London she went to Paris and then, after an extensive tour, to Russia, where she lost her property at the time of the French invasion. Her voice had now failed her, and she became a singing teacher at Reval, where she died in great poverty. Consult Arnold Niggli, *Gertrud Elisabeth Mara* (Leipzig, 1881).

MARABOU (măr′ȧ-bōō′) **STORK** (Fr. *marabout*, Sp. *marabú*, from Ar. *murābiṭ*, hermit, from *rabaṭa*, to bind). The African name of a stork allied to the adjutant (q.v.) or argala of India. Both species belong to the genus *Leptoptilus*, which is remarkable for having the feathers of the anal region lengthened so as to conceal the true tail feathers, and these elongated feathers are the so-called marabou feathers which were formerly much used for trimming ladies' hats and dresses. The African species is *Leptoptilus crumeniferus*. It is white with the back and wings greenish slate color. The sausage-like pouch which hangs from its neck is capable of being inflated, giving the bird a strange appearance. It is gregarious in its wild state, frequenting the mouths of rivers and living upon animals too large for other storks to swallow. It is easily domesticated, but its exceeding voracity impels it on every occasion to purloin poultry, cats, and puppies, swallowing them whole.

MARABOUTS, măr′ȧ-bōōts′. The French form of the name of a Mohammedan sect, from which sprang the Almoravides (q.v.), who founded a dynasty in northwest Africa and in Spain during the eleventh century. In Arabic the term *al Murabituna* (the hermits) is derived from *ribat*, which designates a hermit hut and a fortified place, but came to be a name of not only the hermits themselves, but also of those who joined them in establishing the new dynasty. The descendants of the original ascetic missionaries form to-day a sort of order among the Berbers, leading a sanctified and contemplative life, though the appellation Marabout is generally given them only after their death. They are the western counterpart of the eastern *Mujāhid*, who, suppressing the passions, seeks union (*Ittiḥād*) with Allah, and of the saints (*wālis*) of the Sufis. They are often attached to mosques, chapels, or places of pilgrimage, explaining the Koran and providing the faithful with amulets. As their influence is very great, their orders are implicitly obeyed. There are various divisions among them; the higher Marabouts living in a sort of monastery (*Zāwiyah*) composed of a mosque, a domed building (*kubbah*), in which are the tomb of some saint, schools for children and for the teaching of the Koran and the sciences, as well as living rooms for scholars and travelers. The tomb of the saint is sometimes itself called a Marabout, and is an object of pilgrimage for the pious Mohammedans. Consult Rinn, *Marabouts et Khouans* (Algiers, 1884).

MARACAIBO, mä′rȧ-kī′bō. The capital of the State of Zulia, Venezuela, situated on a sandy plain on the west shore of the strait which connects Lake Maracaibo with the Gulf of Venezuela (Map: Colombia, C 1). It is a handsome town, with a hot but healthful climate, and has several fine buildings, notably the government palace, the city hall, and the school of arts. It has also a nautical school, several libraries, and a hospital well located on an island opposite the city. Its streets are lighted by electricity and traversed by a tramway system. It has manufactures of candles, soap, hats, boots, and lumber. Its importance, however, is due to its harbor, which has the finest dockyards in the Republic and is deep enough to admit the largest vessels; the entrance is, however, made difficult by a shifting bar. It is the only port of entry for western Venezuela and a part of eastern Colombia, with which regions it carries on an active trade. In 1912 it held first rank among the ports of the Republic in exports and second rank in imports, the former amounting to $2,293,802 and the latter $1,217,822. The chief articles of export are coffee, cocoa, quinine, dyewoods, sugar, and hides. Steamship lines run to the United States, and a United States consulate is established here. Pop. (est.), 55,000. Maracaibo was founded in 1571 by Alonso Pacheco.

MARACAIBO, GULF OF. See VENEZUELA, GULF OF.

MARACAIBO, LAKE. A large sheet of water in the northwestern part of Venezuela, connected with the Gulf of Venezuela (or of Maracaibo) by a strait nearly 9 miles wide (Map: Colombia, C 2). It is of nearly rectangular shape, with a length from north to south of 100 miles and a width of 50 to 60 miles. Its extreme depth in the northern part is 500 feet, but it shoals rapidly towards the south, where the shores are low and marshy and the water

shallow. The entrance is obstructed by a bar with only 7 to 14 feet of water, so that large vessels cannot enter. Owing to the narrow entrance and to the great number of rivers which discharge into it, the water of the lake is fresh and the tides are scarcely felt, so that, though its form is that of a marine inlet, it is to be considered as an inland lake. It occupies part of a much larger lake basin surrounded by lofty mountains. This basin has been partly filled up by alluvium, leaving a number of smaller lakes connecting by creeks with the main lake.

MARAGHA, mä'rä-gä'. An old town in the west of Persia, in the Province of Azerbaijan, on the Safi River, 80 miles south of Tabriz (Map: Asia, Central, B 4). It consists mostly of mud houses inclosed by a high, dilapidated wall. The town is celebrated as the site of an observatory which Hulaku Khan built for the astronomer Nasir ed Din. It is surrounded by vineyards and orchards, the produce of which is exported to Russia. Famous marble pits produce a nearly transparent marble. Pop., about 16,000.

MARAIS, mä'rä', Le. 1. A name given during the French Revolution to the centre party of the Legislative Assembly and of the Convention, usually called the Plain. 2. A quarter of Paris, built on marshy ground, east of the Rue Saint-Denis and including the Place des Vosges, formerly, as the Place Royale, the centre of aristocratic Paris. It contains fine buildings from the time of Henry IV and Louis XIII. 3. Vast plains in the west of France, reclaimed from the sea, consisting of two distinct divisions, the Breton or western and the Poitevin or southern.

MARAJÓ, mä'rä-zhō', or Joannes. A large island formed by the estuaries of the Amazon and the Pará and the network of river arms connecting them (Map: Brazil, H 4). It is 165 miles long from east to west and 120 miles wide. Its surface is very low and flat; the northern part consists of immense swamps, while the western part is covered with forests, consisting largely of rubber trees. There are several large lakes in the interior, and in the wet season the greater part of the island is flooded. In the dry season it affords excellent grazing. The population is scanty, consisting largely of hunters and rubber gatherers visiting the island during the dry season. The principal settlement is Sauré, on the east coast.

MARAL, mä'räl'. A large species of deer (*Cervus maral*) of the Caspian provinces of Persia, which is closely related to the European red deer in structure and habits, but is probably distinct from that species. Its antlers always terminate in more than two tines. Consult Lydeker, *Deer of All Lands* (London, 1898).

MÁRAMAROS-SZIGET. A town of Hungary. See Máramaros-Sziget.

MAR'ANATH'A. An expression found in the New Testament near the close of Paul's First Epistle to the Corinthians (xvi. 22: "If any man love not the Lord Jesus Christ, let him be Anathema Maran-atha"; R. V., "anathema. Maran atha"). The term, not being Greek, but Aramaic, has occasioned much discussion. Interpreters ignorant of Aramaic, or in localities where there was no old tradition as to its meaning, considered it a threat of some sort. But ancient Eastern tradition and modern scholarship explain it as made up of two Aramaic words, *māranā* (Our Lord) and *thā* (come). It is therefore to be understood as a fervent prayer or exclamation, "Our Lord, come!" A parallel is found in Rev. xxii. 20: "Even so, come, Lord Jesus." Maranatha is also found in the *Didache* (see Teaching of the Twelve Apostles) apparently with the same sense, at the end of a thanksgiving prayer in connection with the Eucharist. The expression doubtless came into vogue very early in Palestinian circles in connection with the expectation of the speedy return of Jesus, and probably as a part of the celebration of the agapæ or love feasts. Consult: Schmidt, in the *Journal of Biblical Literature*, vol. xiii (Boston, 1894); Gustaf Dalman, *Grammatik des jüdisch-palästinischen Aramäisch*, p. 152 (Leipzig, 1894); James Hastings (ed.), *Dictionary of the Bible* (New York, 1909).

MARANHA, mä-rä'nyä, **MIRANHA,** or **MARIANA.** A fierce cannibal tribe of Arawakan stock (q.v.), ranging from the Jutahy River on the south, across the Amazon and Putumayo, to the Yapurá on the north, in western Brazil and the adjacent parts of Colombia and Peru. They wear wooden labrets and ear pendants, with nose pendants of shell, but do not tattoo. The boring of a child's lips is celebrated by a feast. When a boy is 12 years old four gashes are cut near his mouth by his father, and he must then fast five days. At a later period the boys whip themselves as a test of manhood. In fighting expeditions each man carries a small bag of salt as an antidote against poisoned arrows. The Mirahan dialect is believed by Rivet to be a much modified and differentiated form of the Tupi-Guarani. Consult A. Mochi in *Archives pour l'anthropologie*, vols. xxxii, xxxiii (Paris, 1902–03), and *Journal de la Société des Américanistes de Paris*, vol. viii (n. s., ib., 1911).

MARANHÃO, mä'rä-nyoun', or **MARANHAM.** A northern state of Brazil, bounded by the Atlantic Ocean on the northeast, the State of Piauhy on the southeast, Goyaz on the southwest, and Pará on the northwest (Map: Brazil, H 4). Its area is 150,795 square miles. The surface is only slightly elevated and traversed by a number of rivers. The coast land is generally low and subject to inundations. The climate is hot, the average for the year being 80° F., with very little variation. The boundaries with the states of Piauhy and Pará and most of that of Goyaz are formed respectively by the Parnahyba, Gurupy, and Tocantins rivers. The important rivers of the interior are the Itapicurú, Mearim, Grajahú, and Pundaré. The soil is very fertile and the whole state is well wooded. The chief products are cotton, sugar, tobacco, corn, rice, and cacao. The conditions of the state make it adaptable for stock raising, which is carried on extensively. Agricultural development is greatly handicapped by the scarcity of population, and efforts are being made to establish agricultural colonies for the natives as well as to attract foreign settlers by liberal grants of land. The chief exports are sugar, cotton, rice, rubber, tobacco, cattle, hides, and skins. Pop., 1900, 459,508; 1912 (est.), 520,000. The inhabitants are chiefly whites of Portuguese descent, but there are also a considerable number of negroes and mulattoes and about 20,000 Indians. The capital is Maranhão (q.v.).

MARANHÃO, or São Luiz de Maranhão.

The capital of the State of Maranhão, Brazil, situated on an island lying between the bays of São Marcos and São José, 280 miles southeast of Pará (Map: Brazil, J 4). The climate is very warm, but is not unhealthful. The town is well built and clean and has handsome public buildings, a theatre, a hospital, a cathedral, and a fine bishop's palace. It has training, music, and normal schools, the latter being considered the best in Brazil. The originally good harbor has suffered from silting, but extensive port works were begun in 1908 to improve this condition. The city carries on considerable commerce. In 1913 the imports amounted to $258,677 and the exports $305,189. It is the seat of a United States consular agent. Pop. (est.), 1912, 45,000. The town was founded by the French in 1612. The birthplace of many statesmen and writers, it is renowned for the cultivation of science and letters and is called the Brazilian Athens.

MARANO DI NAPOLI, mȧ-rä′nō dē nä′-pō-lē. A town in the Province of Naples, Italy, situated about 5 miles northwest of Naples. It lies in a fertile region and produces wine, grain, and fruit. Pop. (commune), 1901, 10,317; 1911, 11,934.

MARAÑON, mä′rȧ-nyōn′. A name sometimes applied to the upper course of the Amazon (q.v.).

MARASCHINO, mä′rȧ-skē′nō (It., from *marasca*, a sort of cherry, from Lat. *amarus*, bitter). A liqueur distilled from the fermented juice of the marasca cherry and flavored with its pits. The marasca cherry is a small black fruit, so named from its bitterness. Maraschino is chiefly made in Zara, Dalmatia. See LIQUEUR.

MARASH, mȧ-räsh′. The capital of the sanjak of the same name in the Vilayet of Aleppo, Asiatic Turkey, situated at the foot of Mount Taurus, about 90 miles north-northeast of its port, Alexandretta (Map: Turkey in Asia, C 3). It is a well-built city with fine bazars and a considerable trade in Kurd carpets and embroideries. Besides mosques and Mohammedan schools there are a number of Christian churches, a college and schools attached to the American mission, and a Jesuit establishment. In the vicinity of the town are found traces of Roman fortifications and tombs with Greek inscriptions. Many Hittite monuments have also been discovered near Marash. The population is estimated at from 40,000 to 52,000, including many Armenians.

MARAS′MUS (Neo-Lat., from Gk. *μαρασμός*, *marasmos*, decay, from *μαραίνειν*, *marainein*, to weaken; ultimately connected with Skt. *mar*, to grind, *mlā*, weaken, OIr. *meirb*, AS. *mearu*, OHG. *muruwi*, *murwi*, Ger. *mürbe*, soft). A term somewhat vaguely used by the older medical writers to designate those cases of general emaciation or atrophy for which they did not see any special cause. The word still has a definite connotation as applied to infantile atrophy and is employed to describe a form of wasting due to nutritional disorder combined with bad hygienic surroundings and not dependent upon constitutional diseases such as tuberculosis and syphilis, although these may be an underlying factor in some cases. Marasmus occurs in bottle-fed babies, chiefly among the poor in large cities and in institutions. The symptoms are similar to those of slow starvation; the child, as a result of improper feeding, soon becomes unable to assimilate the food that is given it. The temperature is subnormal, the eyes large and sunken, the skin hangs in loose folds, the limbs are wasted, and the face has an indescribable look of age. The outlook for children under six months old is unfavorable, but timely and appropriate treatment restores some babies to health. This consists in careful feeding, by a wet nurse when practicable, bathing, massage, and fresh air. (See INFANTS, FEEDING OF.) The term is also used occasionally as a synonym for *tabes mesenterica*, or tubercular disease of the mesenteric glands. See TUBERCULOSIS.

MARAT, mȧ′rȧ′, JEAN PAUL (1744–93). One of the radical leaders of the French Revolution, born May 24, 1744, at Boudry, near Neufchâtel, Switzerland. In youth he made himself master of several languages; subsequently he studied medicine at Bordeaux and at Paris, and, after traveling extensively in Europe, removed to London. There he practiced medicine and published *An Essay on Man* (1772) and *The Chains of Slavery* (1776). Returning to Paris, he wrote on optical subjects and electricity and entered the service of the Count of Artois as a veterinary surgeon in 1777. The fruits of his studies in physics appeared in a number of publications on electricity and optics. Upon the outbreak of the Revolution, Marat soon came to the front as one of its most extravagant, passionate leaders, and won a large following. After several abortive journalistic experiments he established, Sept. 12, 1789, a journal, *Le Publiciste Parisien*, which as *L'Ami du Peuple* and, after Sept. 21, 1792, as *Le Journal de la République* became one of the most famous papers of the revolutionary period. In it Marat attacked the moderates of the Constituent Assembly and later the Girondists with such violence that he was compelled on several occasions to take refuge in England. Danton, who had found Marat useful in the preparation of the events which led up to the storming of the Tuileries (Aug. 10, 1792), made him a member of the Commune of Paris. It was in a great measure the influence of Marat which led to the cruelties and massacres of September, 1792, in the midst of which he was elected a member of the Convention. His journal became more radical and vehement than ever. During the King's trial he was urgent for his immediate execution, and in his journal called upon the people to slay 200,000 of the adherents of the old régime. On April 14, 1793, he was brought before the Revolutionary Tribunal on the charge of fomenting sedition, but was acquitted (April 24) and returned to the Convention more powerful than ever. He played probably the leading part in the events of May 31 to June 2, which brought about the downfall of the Girondists, who had long regarded him as their inveterate enemy. On July 13, 1793, Marat was stabbed in his own house by Charlotte Corday (q.v.). His death aroused tremendous public feeling. His bust was placed in the Hall of the Convention; the scene of his murder was painted by David; fêtes in perpetuation of his memory were held all over France; mothers named their children after the "martyr of the people," and in November the Convention decreed to Marat's remains the honors of the Panthéon.

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MARATHI, mä-rä'tē. A language spoken in western India, belonging to the southern group of the Indo-Aryan family, and closely related to Hindi, Gujarati, and other modern vernaculars of Indo-Iranian origin. It is the tongue of between 15,000,000 and 20,000,000 people and is divided into several dialects, which are comprised under the two great groups Dakhani and Konkani. The former of these is found, as its name implies, in the Deccan and contains the standard dialect, called Deshi, spoken near Poona. The district of the Konkani is along the coast in the southwestern portion of the country of the Mahrattas. It contains a considerable mixture of Dravidian words from the neighboring Kanarese, and around Goa it has numerous Portuguese loan words. Marathi as a whole, despite its importations from Persian and Arabic, has departed less from the Sanskrit form than almost any other New Indian language. It is probably descended from the vernacular form of the Maharashtri Prakrit dialect of mediæval India.

Marathi literature is abundant. It begins in the thirteenth century with Namdev, a predecessor of the famous Tukaram (1609 A.D.), who wrote religious poems of a pronounced Vishnuitic trend. Another poet almost as highly esteemed as Tukaram was Mayur Pandit, or Moropant, in the eighteenth century. Prose works in Marathi are comparatively unimportant. Modern literature in this language, under English influence, is copious but rather mediocre. The alphabet employed by the Marathi is the Devanagari, in which Sanskrit is written.

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MAR'ATHON (Lat., from Gk. Μαραθών). Anciently a small town on the coast of Attica, about 20 miles northeast of Athens (Map: Greece, Ancient, D 2). The modern village lies at the point where a valley opens into the plain of Marathon, which is surrounded by a semicircular range of mountains on the north, west, and south, while on the east it is washed by the Bay of Marathon. South of the valley of Marathon is another valley, in which is the little village of Vrana, while from the southern extremity of the plain, between the sea and the mountains, a road leads by a circuitous route between Mounts Pentelicus and Hymettus into the Attic plain. Along with three other towns, Probalinthos, Tricorythos, and Œnoe, Marathon belonged to the Tetrapolis, which claimed a very early legendary origin and independent existence until the time of Theseus. It is clear that the league continued to exist for religious purposes until at least the fourth century B.C., and probably for a longer time. The plain of Marathon is especially famous as the scene of the decisive battle in which Miltiades (q.v.) led the Athenians and the Platæans to victory over the army of Darius under the command of Datis and Artaphernes in 490 B.C. (See GREECE, *Ancient History*.) The details of the battle are not easy to determine, as the ancient accounts are confused. It is probable that the Athenians occupied the valley of Vrana and attacked the Persians either when they were preparing to reëmbark or to execute a turning movement by the road to the south. The Greek force seems to have numbered about 10,000, of whom 192 fell. The numbers of the Persians are unknown, but the traditional 100,000 is certainly much exaggerated; their loss is said to have been 6400. Contrary to custom, the Athenian dead were buried on the field, and over their remains was raised the great mound (or *soros*) which is still conspicuous in the southern part of the plain. Its identity, at one time much disputed, was proved by the excavations of the Greek Archæological Society under Stais, in 1890 and 1891, which brought to light, in a space 85 feet by 20 feet, human bones, ashes, vases of the early fifth century B.C., and a sacrificial trench, where offerings had been made before the earth was heaped up. Some of the remains found in the *soros* are to be seen now in the National Museum at Athens. The literature on Marathon is very extensive. Besides the standard histories of Greece, consult: Ἀρχαιολογικὸν Δελτίον (Athens, 1891); Fraser, *Pausanias*, vol. ii (London, 1898), containing a large bibliography; Milchhöfer's text to Curtius and Kaupert, *Karten von Attika* (Berlin, 1881–95); Macan, *Herodotus*, books iv, v, vi, especially vol. ii, pp. 149–248 (London, 1895); *Journal of Hellenic Studies*, vol. xix (ib., 1899); G. B. Grundy, *The Great Persian War* (ib., 1901); Baedeker, *Greece* (with map: 4th Eng. ed., Leipzig, 1909).

MARATHONIANS. See MACEDONIANS.

MARATTA, mä-rät'tä, or **MARATTI**, CARLO (1625–1713). An Italian painter of the Roman school, born at Camerano. He was a pupil of Andrea Sacchi and was influenced by the works of Raphael and the Carracci. Considered the most eminent painter in Rome, he long enjoyed the papal patronage. In 1702–03 Clement XI commissioned him to restore Raphael's frescoes in the Vatican, and Innocent XI appointed him superintendent of the paintings in the Vatican. He died at Rome as Prince of the Academy of St. Luke. Most of his pictures are small easel paintings in oil, the best being portraits. His design is academic, his color pleasing, his brushwork weak; his style resembles that of Guido Reni, but is even less original. He etched a number of important plates. Among his best paintings are the following: "Madonna," Palazzo Doria, Rome; "Annunciation," Turin Gallery; "Adoration of Shepherds," Basel Museum; "Holy Night," Dresden Museum; "St. John at Patmos," "Sleeping Child," "Portrait of a Cardinal," Old Pinakothek, Munich; "Presentation in the Temple," "Portrait of Clement IX,"

Hermitage, St. Petersburg; "Madonna in Glory," "Hagar and Ishmael," Madrid Museum; portrait of Cardinal Cerri, National Gallery, London.

MAR'AVE'DI, *Sp. pron.* mä'rà-vâ'dē (Sp., from Ar. *Murābitin,* name of a Moorish dynasty, pl. of *murābit,* hermit). The name borne by certain Spanish coins. One of gold weighing about 60 grains was issued by the Moorish emirs in the eleventh and twelfth centuries; subsequently the maravedi constituted the lowest denomination in the Spanish coinage, varying in value from one-seventh to one-third of a cent.

MARBEAU, mär'bō', JEAN BAPTISTE (1798–1875). A French philanthropist, born at Brives. In 1841, while a city official at Paris, in making some investigations of the charitable institutions, he was struck with the lack of provision for the care of babies under two years of age whose mothers were compelled to go out to work. He wrote a book, *Des crèches,* advocating the establishment of day nurseries. The first was established at Chaillot, Nov. 11, 1844. An association of *crèches* was formed in 1846. Throughout the rest of his life, while specially interested in *crèches,* he took an active part in furthering various charities. Among his writings are: *Etudes sur l'économie sociale* (1844; 2d ed., 1875); *Des crèches, ou le moyen de diminuer la misère en augmentant la population* (1845; many later editions); *Du paupérisme en France et des moyens d'y remédier* (1847); *De l'indigence et des secours* (1850). He died at St. Cloud, Oct. 10, 1875.

MARBECK, mär'bĕk, or **MERBECK,** or **MERBECKE,** JOHN (?–c.1585). An English musician and theologian, organist of St. George's Chapel, Windsor, in the reign of Henry VIII and his successor. He early read Calvin's writings, adopted his views, and joined an association in support of the Reformed doctrines. Among the members were a priest, a chorister of St. George's Chapel, and a tradesman, and these men, together with Marbeck, were arrested on a charge of heresy. Their papers were seized, and in Marbeck's handwriting were found notes on the Bible, materials for a concordance in English, and a copy of an epistle of Calvin against the mass. They were all condemned to the stake, but Marbeck, on account of his musical talents and through the interposition of Gardiner, Bishop of Winchester, was pardoned and restored to his place as organist. His trial is related in Foxe, *Acts and Monuments,* book viii (London, ed. of 1857, vol. v). He lived to see the triumph of his principles and to publish his work, *The Boke of Common Praier Noted* (1550), an adaptation of the plain chant of the older rituals to the first liturgy of Edward VI; reprinted in facsimile (1844) and in Jebb's *Choral Responses and Litanies* (1857). He published also his *Concordance* to the Bible (1550), which was the first work of the kind in English on the entire Bible. A Te Deum of his and a mass of five voices are found in Smith's *Musica Antiqua,* now in the British Museum. In 1574 was published *The Lyves of Holy Sainctes, Prophetes, Patriarches, and Others* and subsequently *The Holie Historie of King David, drawn into English meetre* (1579) and *A Ripping Up of the Pope's Fardel* (1581).

MARBELLA, mär-bā'lyà. A port of south Spain in the Province of Malaga (Map: Spain, C 4). It is situated amid picturesque surroundings on the shore of the Mediterranean, 35 miles northeast of Gibraltar. It is well built, with a notable church of the Incarnation and the ruined castle of San Luis, its former defense, on the adjoining hill. In the neighborhood are granite quarries and mines of sulphur, lead, and iron; the town has iron foundries and sugar refineries. The harbor is used principally in local coasting trade; it is an ill-sheltered, open roadstead, but equipped with a large iron pier reaching into deep water and a lighthouse visible for 12 miles. The principal exports are iron, grain, sugar, cork, and fish. Pop., 1900, 9075; 1910, 10,286.

MAR'BLE (OF. *marble, marbre,* Fr. *marbre,* Prov. *marme, marbre,* from Lat. *marmor,* marble, from Gk. *μάρμαρος, marmaros,* bright stone, marble, from *μαρμαίρειν, marmairein,* to sparkle). In a strict sense a crystalline limestone having a granular structure. The term has, however, become broadened as a result of commercial use and now includes any limestone, either crystalline or noncrystalline, which will take a polish. Marbles vary considerably in their texture and color. Some are extremely fine-grained, like those of Vermont, while others are coarsely granular, as some Georgia ones. Those composed entirely of calcite or dolomite are pure white, but many are colored gray or blue by carbonaceous or graphitic matter, and sometimes grayish or greenish by fine scales of micaceous minerals. Others exhibit beautiful shades of pink, yellow, red, and brown, due to iron compounds. The mineral impurities which give the varied colors to the stone are often disposed in patches or wavy bands, and highly ornamental effects are sometimes obtained by properly matching these banded slabs. The presence of fossil remains may also add to their beauty. Marbles are usually found in regions of metamorphic rocks (see GEOLOGY), and hence the rock has been at times subjected to crushing forces. These have developed fissures in the rock, which subsequently became filled by foreign mineral matter, and it is to this that much of the beautiful marking or veining of many ornamental marbles is due.

Marble occurs in many geological formations, but in the United States it is obtained mostly from the Paleozoic rocks. The best-known deposits are found in the Eastern States. In western Vermont, at West Rutland, Proctor, Brandon, and other localities, some of the quarries have reached a depth of 400 feet and contain many grades, varying from the purest white statuary marble to the gray, or "true blue" variety, as it is called. In recent years gray and green banded marbles have been quarried to an increasing extent for decorative work. A fine-grained, white, dolomitic marble is quarried at Lee in western Massachusetts, and a medium-grained gray marble for structural work is obtained from St. Lawrence Co., N. Y. Cockeysville, Md., furnishes white marble, but is the most important Southern producer of gray and white stone for structural and decorative purposes. Near Swanton, Vt., there occurs a deposit of variegated marble much used for wainscoting and floors. Some of the varieties found here resemble imported marbles. The pink and brown marbles are widely used for wainscoting and flooring. Aside from the above areas, marble of white and gray striping is quarried in Inyo Co., Cal., and a white marble is now being quarried in Colorado. Two types which have attracted some attention are the serpentine, or verde antiques, found in eastern

SUTHERLAND FALLS QUARRY OF THE VERMONT MARBLE CO., AT PROCTOR, VT.

Pennsylvania, and the onyx marbles from Arizona, Colorado, and California. These latter are not true onyx, but a travertine, composed of carbonate of lime, and formed in caves or around calcareous springs. Serpentine marble, although of high ornamental value, should not be used exteriorly in severe climates.

Many ornamental marbles are imported into the United States from various European countries. Among the more important types are: *Skyros* from Greece, the brecciated variety being much employed; *Black and Gold*, a black Italian limestone veined with yellow; *Brocatelle*, a light-yellow marble with red cloudings, obtained from the Pyrenees; *Carrara*, the white marbles quarried at Carrara, Italy; *Giallo antico*, a yellow marble much sought after by the ancient Greeks and Romans; and *Griotte*, a bright-red variety, obtained in the Pyrenees. The last named is also found at Swanton, Vt. *Landscape* marble is a variety containing coloring matter dispersed through it in such a manner as to resemble a landscape. *Nero antico* is a greenish-black serpentine marble; *Numidian* marble is an African variety, often of yellow color; *Parian*, a white marble much used by the ancient Greeks and obtained from the island of Paros; *Pentelic* is another white marble used by the ancient Greeks, occurring near Athens; *Rosso antico*, a red marble; *Siena*, a yellowish marble, often with veins or patches of gray or purple.

The most famous marble known to the ancients was the Parian marble, which was a finely granular and very durable stone, of waxy appearance when polished. Some of the finest Grecian sculptures were formed of this marble, among them being the Venus de' Medici. The Pentelic marble was at one time preferred by the Greeks to Parian, because it was whiter and finer grained. The Parthenon was entirely built of it. It does not resist the weather well. The quarries at Carrara were known to the ancients, but their chief importance has been in modern times. The temple of Jupiter Serapis near Naples was constructed of a gray-streaked micaceous marble, much used by the ancients and known as *cipolino*.

Marble suitable for structural work sells for about $1.30 to $1.50 rough per cubic foot, while monumental stone brings a little more, but good statuary marble may bring as much as $10 per cubic foot. Marble must commonly meet certain requirements as to strength, color, texture, freedom from flaws, and durability in the open air. Its crushing strength is commonly from 10,000 to 12,000 pounds per square inch.

The opening of a marble quarry is usually expensive and attended with financial risks, as a thickness of from 10 to 30 feet of rock usually has to be taken off before sound marble is reached. After a sufficient area of surface has been prepared by the removal of the imperfect stone, channeling machines, which may be either percussion or diamond drills, are set to work and rectangularly crossed channels are cut to a desired depth, say from 5 to 7 feet. One of the blocks, called the key block, is then broken off at the base by wedging and lifted out with a crane. This gives ready access to the others, which are then drilled as circumstances may require, the quarry being worked out in floors. The blocks removed commonly run 4 feet, 6 inches by 6 feet, 6 inches, but much larger ones are sometimes extracted on special demand. The marble after quarrying is taken to the mill and sawed into blocks or slabs or chiseled into monumental pieces. The first smoothing is done with sand and water, but the final polishing with a mixture of putty powder and weak acid rubbed on with a flannel-covered revolving buffer. The value of marble produce in the United States in 1913 was as follows:

Sold by producers in rough state	$3,645,863
Dressed for:	
Building (exterior)	829,244
Ornamental purposes	34,850
Monumental work	1,135,658
Interior decoration	1,869,262
Other uses	356,013
Total, United States	$7,870,890
Imports, 1913	1,367,607
Total consumption	$9,238,497

Of the total United States value, Vermont produced 44.64 per cent, Tennessee 18, and Georgia 14. See BUILDING STONE.

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MARBLE, MANTON (1834–1917). An American journalist. He was born at Worcester, Mass.; graduated at the University of Rochester in 1855; and became a journalist in Boston, where he was assistant editor for a year of the *Journal* and editor for another year of the *Traveler*. He removed to New York in 1858 and was employed during the next two years on the editorial staff of the *Evening Post*. In 1860 he united with others in founding the *World*, of which he was proprietor and editor from 1862 to 1876. The publication of the *World* was temporarily suspended by President Lincoln for the printing of false dispatches in 1864. Marble wrote the Democratic State platform of 1874, the Democratic national platform of 1876, and most of the national platform of 1884. In 1878 he published *A Secret Chapter of Political History*, in which he upheld Tilden's claim to the presidency. In 1885 he was appointed a special envoy to Great Britain, France, and Germany on bimetallic questions.

MARBLED GODWIT. See GODWIT.

MARBLED TIGER CAT. A very distinct and beautiful wild cat of the eastern Himalayas and Malayan region (*Felis marmorata*), which in appearance is a miniature of the clouded leopard. It is about the size of the domestic cat and has unusually soft and warm fur and a long tail, not ringed, but spotted. The ground color is dull reddish yellow, marked with numerous elongate, wavy black spots, somewhat clouded or marbled. There are dark lines on the head, and the flanks and legs are thickly spotted with black, while the belly is yellowish white. It has a Tibetan variety. Its habits are little known, but are supposed to be mainly arboreal.

MARBLE FAUN, THE. A romance by Haw-

thorne (1860). The title originally proposed was *The Transformation of the Faun*, changed in the English edition to *Transformation*, and in the American to *The Marble Faun*.

MARBLEHEAD′. A town, including the villages of Clifton, Devereux, and Marblehead Neck, in Essex Co., Mass., 18 miles northeast of Boston, situated on a rocky peninsula in Massachusetts Bay and on the Boston and Maine Railroad (Map: Massachusetts, F 2). It is a port of entry and has a deep and safe harbor, is a popular yachting and summer resort, and possesses many pre-Revolutionary buildings and other features of historic interest. In Abbot Hall are the town offices, the public library, and an art gallery. There are Crocker, Fort Sewall, and Fountain parks. The principal industries include boat building and the manufacture of shoes and aëroplanes, though fishing and seed growing are of some importance. The government is administered by town meetings. There are municipal water works and electric-light plant. Pop., 1900, 7582; 1910, 7338. Settled in 1629 by emigrants from the east and south of England, and later by people from the islands of Jersey and Guernsey, Marblehead was under the jurisdiction of Salem until 1649, when it was incorporated as a separate town. It ranked for a time next to Boston in its maritime and fishing trade. Marblehead was the birthplace, and for many years the home, of Elbridge Gerry and Judge Story. Consult Roads, *The History and Traditions of Marblehead* (Marblehead, 1897).

MARBLEHEAD. A sailors' name for the North Atlantic fulmar (q.v.).

MAR′BLE PLAN. See FORMA URBIS ROMÆ.

MARBLES AND MARBLE PLAYING. Marbles are little balls of marble or some other hard substance and are used as playthings by children. They have been in use from the earliest times and are to be found among all the peoples of the world. They are manufactured in large quantities in Saxony and are exported to India, China, Africa, and practically every nation of Europe and America. There is an endless variety of games of marbles.

MAR′BO, or **MAROBO′DUUS** (c.11 B.C. –41 A.D.). A Germanic chief, King of the Marcomanni. See MARCOMANNI.

MARBOD, mär′bō′, or **MARBODIUS** (c.1035–1123). A French bishop and author. He was born at Angers, the son of a merchant, and taught with great success, becoming in 1067 head of the diocesan school, in which he trained many prominent scholars and statesmen. Marbod was made Archdeacon in 1081 and Bishop of Rennes in 1096. In 1104 he took part in the Council of Tours, and in 1109 he was administrator of the diocese of Angers during the absence of the Bishop. His works include biographies, hymns, the *Versus Canonicales*, valuable as giving a picture of the monkish life of the period, and *De Lapidibus Pretiosis*, which, following a Greek original, treats of the mysterious properties of gems. Marbod's works are contained in Migne, *Patrologia Latina*, vol. clxxi (1854). His hymns are to be found in Blume and Dreves, *Analecta Hymnica* (Leipzig, 1907).

MARBOIS, mär′bwä′, FRANÇOIS, MARQUIS DE BARBÉ. A French statesman. See BARBÉ-MARBOIS.

MARBURG, mär′burk. A town in the Crownland of Styria, Austria, 37 miles south-southeast of Gratz, in the wooded plain on the left bank of the navigable Drave (Map: Austria, D 3). The town has a sixteenth-century cathedral, a mediæval castle, an episcopal palace, and a casino. It is the seat of the Prince-Bishop of Lavant. Its educational institutions include schools of theology and pedagogy, a pomological school, and a school for vintners. The chief industries are the manufacture of leather, footwear, iron, cement, cutlery, flour, and spirits. The extensive workshops of the Southern Railway are situated in the suburb of Sankt Magdalena. Marburg carries on an extensive trade in wine, grain, poultry, and lumber, the chief products of the surrounding country. Pop., 1900, 24,501; 1910, 22,994, mostly Germans. Consult Bücking, *Geschichtliche Bilder aus Marburgs Vergangenheit* (Marburg, 1901).

MARBURG. A town in the Province of Hesse-Nassau, Prussia, on the Lahn, 60 miles north of Frankfort (Map: Germany, C 3). The town is built on terraces from the river up to a thirteenth-century castle on the summit. The castle was originally the residence of the landgraves of Hesse, later a state prison, and is now a repository for the Hessian state archives. In its Rittersaal the disputation concerning transubstantiation between Luther and Zwingli took place in 1529. Its thirteenth-century church of St. Elizabeth, a perfect specimen of early Gothic architecture, was erected by the Teutonic Knights and contains the fine tomb of the saint, as well as numerous monuments to the Hessian rulers and Teutonic Knights. Noteworthy are also the Rathaus (1512), the fourteenth-century Lutheran church, and the government buildings. The educational institutions of Marburg include the university with a library of 260,000 volumes (see MARBURG, UNIVERSITY OF), a Gymnasium, a Realschule, a nurses' school, and an agricultural school. The chief manufactures are leather, pottery, machinery, surgical instruments, pewter ware, toys, cornets, carpets, and tobacco. The environs are of great natural beauty. Pop., 1900, 17,527; 1910, 21,860, chiefly Protestants.

First mentioned in 1140, Marburg was endowed with municipal rights by the Landgrave Louis of Thuringia in 1227, and after his death became the residence of his widow, Elizabeth of Hungary. During the fifteenth and sixteenth centuries Marburg was one of the residences of the landgraves of Hesse. It passed with Hesse-Cassel to Prussia in 1866. The fortifications were demolished by the French in 1810–11.

MARBURG, KONRAD VON. See KONRAD VON MARBURG.

MARBURG, THEODORE (1862–). An American publicist, born at Baltimore, Md. He studied at Johns Hopkins (1880–81), at Oxford, England (1892–93), at the Ecole Libre de la Science Politique, Paris (1893–95), and at the University of Heidelberg (1901 and 1903). He became active in various economic, political, law, art, and peace societies; became trustee of Johns Hopkins; and was United States Minister to Belgium in 1912–13. He translated Emile Levasseur's *Elements of Political Economy* and published: *In the Hills* (1895), a poem; *The World's Money Problem* (1896); *The War with Spain* (1898); *Expansion* (1900); *The Peace Movement Practical* (1910); *Salient Thoughts —Judicial Settlement Conference* (1911); *Philosophy of the Third American Peace Congress* (1912).

MARBURG, UNIVERSITY OF. The first Protestant university of Germany, founded by Philip,

Landgrave of Hesse, in 1527, and endowed with the income of 13 suppressed monasteries. The Imperial assent was given in 1541. The new foundation drew largely from Wittenberg for its early teaching staff, became a stronghold of Lutheran doctrine, and flourished accordingly. In 1607 Landgrave Moritz converted it into a Calvinistic school, which conversion resulted in the departure of many professors and students and the foundation of the University of Giessen. The Thirty Years' War nearly ruined the university, which was reconstituted in 1653. Since the incorporation of Hesse-Cassel with Prussia it has flourished greatly. The university developed especially the provision of facilities for the study of modern languages and philology and maintained a strong summer school in these subjects. In 1913 it had a budget of nearly 1,500,000 marks, and 2406 students, including 163 women, in theology, medicine, law, and philosophy, the majority being in the two latter faculties. Its library contains about 260,000 volumes and 200,000 dissertations.

MARBURY vs. MAD'ISON. The title of a famous decision rendered by the Supreme Court of the United States in 1803 and reported in the first volume of *Cranch's Reports*. Its importance in the constitutional development of the United States lies in the fact that this was the first instance in which the Supreme Court assumed the right to declare a statute of Congress null and void on account of its repugnance to the Constitution. It is popularly regarded as the chief basis for the American doctrine of the right of the courts to disregard unconstitutional statutes, although the right had been asserted by State courts in some half a dozen instances before the adoption of the Federal Constitution. The case of Marbury *v.* Madison arose out of an attempt of the plaintiff to secure a writ of mandamus from the Supreme Court to compel James Madison, then Secretary of State, to deliver to him a commission as justice of the peace of the District of Columbia. Marbury had been appointed to this office by President Adams, the Senate had confirmed the nomination, and his commission had been made out, signed and sealed, but had not been delivered. When Madison entered upon his duties as Secretary of State he found the commission and refused to deliver it. Marbury, in bringing his suit, relied upon an act of Congress which empowered the Supreme Court to issue the writ of mandamus to executive officers to compel them to perform their duties in certain cases. But as the Constitution expressly enumerates the cases in which the Supreme Court shall have original jurisdiction and nowhere mentions the right of issuing the writ of mandamus, the congressional act in question was clearly without constitutional warrant. This evident repugnance of the statute to the Constitution was the first question decided by the court. The second point in the decision related to the power of the court to declare the act null and void and to refuse to be bound thereby when its repugnance to the Constitution was once established. Chief Justice Marshall, who delivered the opinion of the court, declared that if two laws conflict with each other, the courts must decide on the operation of each, and if a law be in opposition to the Constitution so that the court would have to decide the case conformably to the law disregarding the Constitution or conformably to the Constitution disregarding the law, the court must decide which of these conflicting rules governs the case. If then, he said, the courts are to regard the Constitution, and if the Constitution is supreme over any ordinary statute, the Constitution and not the statute must govern the case to which they both apply. Marshall's argument was readily accepted as the only correct and just rule, and thus was laid the foundation of a judicial prerogative which has immensely influenced the legal and constitutional development of the United States. Consult: T. M. Cooley, *Constitutional History of the United States* (New York, 1889); J. B. Thayer, *John Marshall* (Cambridge, 1904); id., *Legal Essays* (Boston, 1908). See CONSTITUTIONAL LAW.

MARCA, mär'kä', PIERRE DE (1594–1662). A French historian and ecclesiastic, born at Gan, near Pau. He studied law at the University of Toulouse, and for his zealousness in reëstablishing the Catholic faith in Béarn he was appointed president of Pau in 1621 by Louis XIII. After the death of his wife in 1631 he studied theology, in 1639 he became a member of the Council of State, and in 1641 the King made him Bishop of Couserans. From 1644 to 1651 he was Intendant or Governor of Catalonia, then held by the French, and in 1652 he became Archbishop of Toulouse. During the uprising of the Fronde Marca supported Louis XIV in opposition to the Pope, and he succeeded Retz, who resigned, as Archbishop of Paris in 1662. His historical writings include: *Histoire de Béarn* (1640); *De Concordia Sacerdotii et Imperii seu de Libertatibus Ecclesiæ Gallicanæ* (1641); *Marca Hispanica seu Limes Hispanicus* (1688).

MAR'CASITE (Fr. *marcassite*, Sp. *marquesita*, from Ar. *marqashītha*, from *raqasha*, to speckle, to embellish). An iron disulphide that crystallizes in the orthorhombic system, has a metallic lustre, is of a pale bronze-yellow color, and resembles pyrite, from which it differs only in crystalline form. It is found in Bohemia, Saxony, Hungary, and in the United States at various localities in New York, Massachusetts, Connecticut, and New Hampshire. The mineral is mined in some parts of Europe for its sulphur and for the ferrous sulphate that may be made from it. The word was applied indifferently to crystallized varieties of iron sulphide until 1845, when it was retained exclusively for the orthorhombic variety.

MARCATO, mär-kä'tō (It., marked). In music, a term signifying in a strongly accentuated manner.

MARCEAU, mär'sō', FRANÇOIS SÉVERIN, called MARCEAU-DESGRAVIERS (1769–96). A soldier of the French Revolution, born at Chartres. He joined the army as a private at the age of 16, participated actively in the capture of the Bastille, and in 1792 was in the Army of the Ardennes commanded by Lafayette. His services under Westermann in La Vendée made him general of division in 1793. With Kléber he crushed the rebellion at Cholet, then fought under Jourdan in 1793–94. A Prussian sharpshooter mortally wounded him at Altenkirchen. In 1889 his remains were placed in the Panthéon at Paris.

MARCEL, mär'sĕl', ETIENNE (?–1358). Provost of the merchants of Paris. After the battle of Poitiers (q.v.), in 1356, Marcel took the government of Paris into his own hands. To check the abuses to which the citizens were subjected he had two of the most prominent officials

of the King put to death. In order not to be obliged to obey the commands of King John, who was a prisoner in the hands of the English, Marcel induced the Dauphin to take the regency. Finding the Regent opposed to him, he sought aid from Charles the Bad, King of Navarre, and from the Jacquerie (q.v.). This made him unpopular and he was slain by a rising on July 31, 1358. For a few months he had been the most powerful man in France. It is impossible now to judge his conduct or his aims with certainty. Consult Ernest Lavisse, *Histoire de France depuis les origines jusqu'à la révolution*, vol. iv, part i (Paris, 1902), and the works cited there.

MARCELINE, mär'sē-lēn'. A city in Linn Co., Mo., 106 miles northeast of Kansas City, on the Atchison, Topeka, and Santa Fe Railroad (Map: Missouri, C 2). It is in a rich coal and oil region, having three mines and an oil and gas pumping station. There are railroad shops and roundhouse of the Santa Fe System, and a concrete-block factory. Marceline contains a sanitarium and municipal water works and electric-light plant. Pop., 1900, 2638; 1910, 3920.

MAR'CELLI'NUS, Saint. Bishop of Rome, or Pope, 296–304. He was born in Rome, but little is known of his life or administration. There is an account of a synod held at Sinuessa in 303 or 304, at which Marcellinus is said to have confessed that, at the instance of Diocletian, he had offered incense to Vesta and Isis. The synod is said to have deposed Marcellinus, who, with many members of the synod, was put to death by Diocletian. The story is denied by Augustine and Theodoret and is not credited by either the Roman Catholics or the Protestant controversialists. The Roman church commemorates Marcellinus on April 24. Consult J. J. I. von Döllinger, *Fables Respecting the Popes of the Middle Ages* (New York, 1871).

MARCELLO, mär-chĕl'lô, Benedetto (1686–1739). An Italian composer. He studied music under Gasparini and Lotti and is chiefly known for the music to Giustiniani's paraphrase of 50 Psalms. He also wrote an opera *Le Fede riconosciuta*, an oratorio *Giuditta*, five *concerti*, and a number of sonatas. The characteristics of his musical style are melody, simplicity, and a sound good taste. He was also an instructor of wide reputation, and a conservatory at Venice is named after him. He wrote the satire *Il teatro alla moda* (1720). Consult Enrico Fondi, *Benedetto Marcello* (Rome, 1909).

MARCEL'LUS. The name of two popes. —Marcellus I, Saint, Pope, 308–309, a Roman by birth, elected after an interregnum of four years due to the persecution of Diocletian. A new outbreak under Maxentius drove him from Rome, the attention of the heathen authorities being directed to him by his severity against the lapsed. He died in exile, but his body was brought back to Rome and buried in the cemetery of Priscilla with that of his predecessor, Marcellinus. His feast day is January 16.—Marcellus II, Pope, 1555, Marcello Cervini degli Spannocchi. He was born in 1501 at Montepulciano and made Bishop of Nicastro and Cardinal in 1539. He was one of the legates appointed to preside over the Council of Trent, and was elected Pope in spite of the opposition of the Imperial party. His reign, however, for which his character and learning had given great hopes, lasted only 22 days. Palestrina's famous "Missa Papæ Marcelli," written in 1562, was named in his honor, and the name gave rise to the story that it was sung in his presence and won the Pope's regard for polyphonic music.

MARCELLUS, Marcus Claudius (c.268–208 B.C.). 1. A famous Roman general. He belonged to a distinguished plebeian family. He was consul for the first time in 222 B.C., and obtained a decisive victory over the Insubrians in Cisalpine Gaul, slaying with his own hand their King, Britomartus or Viridomarus, whose spoils he dedicated to Jupiter; for this he was honored with a triumph. This was the third and last occasion in Roman history on which *spolia opima* were offered to Jupiter Feretrius. In the Second Punic War, after the defeat of the Romans at Cannæ, Marcellus fought as prætor, in 216 B.C., against Hannibal at Nola in Campania; and the victory which he gained there was the more important as it showed that Hannibal was not invincible, and that the Romans had not been irreparably overthrown at Cannæ. In the course of two years he thrice repulsed the Carthaginian general at this place. Being consul again in 214 B.C., he was intrusted with the command of the war in Sicily. He took Leontini, massacring in cold blood 2000 Roman deserters whom he found there, and then advanced against Syracuse, which he tried to storm. All his efforts were rendered unavailing by the skill of Archimedes, and he was compelled to blockade the city. Famine, pestilence, and ultimately treachery on the part of the Spanish auxiliaries of the Syracusans enabled Marcellus to make himself master of the place (212 B.C.), after which the remainder of Sicily was soon brought under the dominion of the Romans. In 210 B.C. he was again consul and was again opposed to Hannibal, with whom he fought an indecisive battle at Numistro in Lucania, and by whom he was defeated at Canusium in Apulia in 209 B.C. On the following day, however, he retrieved the defeat. In 208 B.C. he was for the fifth time elected to the consulate, and assumed once more the command of the Roman army against Hannibal. When out reconnoitring one day he fell into an ambuscade near Venusia and was slain. Consult Livy, books xxiii–xxvii, passim, and the article "Claudius 45," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914). 2. A distinguished Roman orator, a vigorous opponent of Julius Cæsar, who, when consul in 51 B.C., proposed that Cæsar's command in Gaul should end in March, 49. In January, 49, when Pompey's supporters were keen for war with Cæsar, he urged delay till a suitable army could be prepared, but unsuccessfully. He went to Greece with Pompey, but after the battle of Pharsalus he retired to Mytilene, to study rhetoric and philosophy. In 46 the Senate appealed to Cæsar to pardon him; in support of this appeal Cicero delivered his speech *Pro Marcello*. When the pardon was granted Marcellus started for Rome, but was murdered at Athens by one of his retinue. 3. The son of Augustus' sister Octavia, and C. Marcellus; he was born in 43 B.C. In 25 B.C. the Emperor adopted him as his son and successor and married his daughter Julia to him, but two years later the young man died, at Baiæ. In certain famous lines (*Æneid*, vi, 860–886) Vergil refers to his death. Augustus named a theatre in Rome in his honor.

MARCELLUS, Nonius. See Nonius Marcellus.

MARCELLUS, Theatre of. A theatre in Rome, begun by Julius Cæsar, completed by

Augustus in 13 B.C., and named for his nephew and son-in-law Marcellus. (See MARCELLUS, 3.) The stage lay towards the river. Of the semicircular structures which carried rows of seats a large portion, comprising 12 arches in two tiers, is still standing. This portion is similar in general external appearance to the Coliseum, and is built of travertine with Doric arcades in the lower tier and Ionic in the upper. The arrangements of the cross walls and seats within the theatre were also duplicated in the Coliseum. The pilasters of the third story were Corinthian and the windows were rectangular. The theatre, according to ancient authorities, could seat about 13,500 spectators; Ch. Huelsen, in *Bulletino della commissione archeologica comunale di Roma* (1894, p. 312), gives the seating capacity as 9000 to 10,000. In the fourth century some of the travertine blocks were used in restoring the Cestian bridge. In the eleventh century the building was turned into a stronghold of the Pierleoni, and in the fourteenth century it was purchased by the Savelli, upon whose extinction it passed to the Orsini in 1712. The palace of the latter family stands upon the stage and the seats, which are buried under 15 feet of modern soil. Many corridors and chambers of the original building are preserved and are used as offices of the palace. The remains of the Doric arcades are used as low shops. Consult: R. A. Lanciani, *The Ruins and Excavations of Ancient Rome* (Boston, 1897); S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., ib., 1911); Charles Knapp, "The Roman Theater," in *Art and Archæology*, vol. i (New York, 1915).

MARCH. See MARCHING.

MARCH. See MONTH.

MARCH (OF., Fr. *marche*, from Goth., OHG. *marka*, Ger. *Mark*, AS. *mearc*, border; connected with Lat. *margo*, OIr. *brú*, Welsh, Corn. *bro*, Av. *mərəzu*, boundary). A term applied in England during the early Middle Ages and later to the frontier or border line between England and Wales and between England and Scotland. In Anglo-Saxon times the word appears under the form Mercia as the name of the most western of the English kingdoms. See MARK.

In Scotland the word came into common use to designate the boundaries of real property, corresponding to the English term "boundary" (q.v.).

MARCH, märk (Lat. *Marus*, Slav. *Morava*). A tributary of the Danube and the principal river of Moravia (Map: Austria, E 2). It rises in the Sudetic Mountains on the boundary of Silesia, and runs southward, forming in its lower course the boundary between Austria and Hungary, and entering the Danube 26 miles east of Vienna, after a course of about 217 miles, for the last 80 of which it is navigable. Its headwaters lead to the Moravian Gap or Gate. See MARCHFELD.

MARCH (Fr. *marche*, from *marcher*, to walk, march, probably from OF., Fr. *marche*, boundary; or possibly from Lat. *marcus*, hammer; connected with Skt. *mar*, to grind, on account of the beat of the feet). A musical composition having primarily as its object the regulation of the steps of a large number of persons in motion. Even in remote antiquity solemn processions were always accompanied by music. In the Greek tragedy the entrance as well as the exit of the chorus was so accompanied. The military march undoubtedly was developed from soldiers' songs. The ordinary march used for parades, drills, etc., has about 75 steps to the minute, the quickstep about 100, and the double quick or charge about 120. The march as an art form was developed from the dance forms during the seventeenth century. Lully in his operas and F. Couperin in his piano works established the march form as consisting of two reprises of eight or 16 measures. To this was added, somewhat later, a portion distinguished by repose and broad melodic outline, generally in a closely related key. This was called the trio, because at first it was in three-part writing as against the two-part writing of the first section. After the trio the first section is repeated. To-day the art form of the march is highly developed and employed on various occasions. A special kind of march is the funeral march. It is written in very slow time (grave, lento, adagio) and always in the minor mode. The trio is in the relative or corresponding major. Beethoven's great funeral march in the *Eroica Symphony* is in C minor with trio in C major; Chopin's funeral march in the Sonata op. 35 is in B flat minor with trio in D flat major.

MARCH, ALDEN (1795–1869). An American surgeon, born at Sutton, Mass. He attended medical lectures in Boston and at Brown (M.D., 1820). Subsequently he served as professor in the Vermont Academy of Medicine (1825–31), in Albany Medical Seminary (1827–33), and in Albany Medical School (1833–34). In 1834 he established a school of practical anatomy and in 1839 he founded the Albany Medical College, which absorbed the other medical schools of that city. In this new institution March held the chair of surgery from 1839 until his death. The growth and development of the college are largely to be attributed to his work. He was also the founder of the Albany City Hospital. March was president of the New York State Medical Society (1857) and a founder of the American Medical Association, of which he was president in 1864. He was a successful operator and originated several well-known surgical appliances, such as an improved splint for use in hip disease (1853), an improved harelip forceps (1855), instruments for the removal of dead bone (1860), and a new instrument for the removal of urinary stones. He contributed largely to medical journals and is the author of *Wounds of the Abdomen and Larynx* (1854).

MARCH, AUSIAS (?1397–1459). A Catalan poet, born in Valencia, probably before the end of the fourteenth century. He was admired and praised not only by his fellow citizens in Cataluña, but also by noted Spanish authors. In March's chief works, the *Cants d'amor* and the *Cants de mort*, he is visibly under the influence of Petrarch, as are so many of his contemporaries. He avoided all close imitation, however, and may safely stand on his own merits. Liveliness of fancy and genuineness of sentiment are among his best traits; his chief defect is a certain obscurity of expression. Consult the edition of his poems by Pelayo y Britz (Barcelona, 1864) and that of Barcelona, 1888, neither of them a good reproduction of the sixteenth-century editions; J. Rubió y Ors, *Ausias March y su época* (ib., 1862); A. Pagès, "Documents inédits relatifs à la vie d'Ausias March," in the *Romania*, vol. xvii (Paris, 1888). The best edition of his works is that by Amadeu Pagès, *Les obres d'Auzias March* (3 vols., Barcelona, 1912 et seq.).

MARCH, Earl of. See Wemyss.

MARCH, Earl of. See Mortimer, Roger de.

MARCH, Field of. See Champ de Mars.

MARCH, Francis Andrew (1825–1911). An American philologist and author, born at Millbury, Mass. He graduated in 1845 at Amherst, where he was tutor in 1847–49, and, after studying law in New York, was in 1850 admitted to the bar. He taught at Fredericksburg, Va., from 1852 to 1855 and from 1856 to 1906 was professor of English language and comparative philology in Lafayette College. He became honorary emeritus professor under the Carnegie endowment in 1907. In 1873–74 and 1895–96 he served as president of the American Philological Association, from 1876 to 1905 as president of the Spelling Reform Association, and in 1891–93 as president of the Modern Language Association of America. He received honorary degrees from Princeton, Amherst, Columbia, Oxford, and Cambridge. In 1879 he was chosen to be the head of the American staff of *A New English Dictionary on Historical Principles*, prepared under the direction of the Philological Society of London. March's article "On Recent Discussions of Grimm's Law," which was published in the *Transactions* of the American Philological Association of 1873, anticipated to a great extent the law of vocalic accent discovered by Verner in 1877. His publications include: *A Method of Philological Study of the English Language* (1865); *Anglo-Saxon Reader* (1870); *Comparative Grammar of the Anglo-Saxon Language* (1870); and a *Thesaurus Dictionary of the English Language* (1903). He also edited a series of textbooks of Greek and Latin authors, and was consulting editor of the Standard Dictionary (1890–94). Consult *Addresses in Honor of Prof. F. A. March*, delivered at Easton, Pa., on Oct. 24, 1895, and J. W. Bright, "Address in Commemoration of Francis Andrew March," in *Modern Language Association of America, Publications*, vol. xxix (Cambridge, 1914).

MARCHAND, mär'shän', Félix Gabriel (1832–1900). A Canadian statesman, born at St. John's, Quebec. He studied at St. Hyacinthe College and was admitted a notary in 1855. In 1867 he was elected a Liberal member of the Legislative Assembly of the Province of Quebec, from 1878 to 1879 was Provincial Secretary, and in the latter year was also Commissioner of Crownlands. From 1887 to 1892 he was Speaker of the Assembly, in 1892 succeeded Honoré Mercier (q.v.) in the leadership of the Liberal party in the Legislature, and in 1897 was appointed Premier and Treasurer. In 1860 he established *Le Franco-Canadien*, which he edited for many years. He wrote: *Fatenville* (1869); *Erreur n'est pas compte* (1872); *Un bonheur en attire un autre* (1884); *Les faux brillants* (1885).

MARCHAND, Jean Baptiste (1863–). A French officer and explorer, born at Thoissey, Ain. He entered the army in 1883, received a commission in 1886, and from 1888 to 1899 he explored parts of Africa. His explorations in search of an improved route to the Gulf of Guinea from the valley of the Niger resulted in a scheme for the Transnigerian Railway between the Bandama and Niger rivers. In 1898 he established on the White Nile the post of Fashoda, which resisted attacks from the dervishes, but found a more formidable foe in General Kitchener, who, with British forces fresh from their victory over the Mahdi, was determined to take possession of the country. Major Marchand refused to withdraw, and international complications ensued; but the affair was settled when the French government retired from the position while Marchand was on his way home to report. He took part in the expedition for the relief of Peking in 1902 and was promoted to the office of colonel, but resigned in 1904, not being permitted by his government to enter the Russian army during the Russo-Japanese War. He was made a Commander of the Legion of Honor. Consult Murphy, *Le commandant Marchand et ses compagnons d'armes à travers l'Afrique* (Paris, 1900). See Kodok.

MARCHANT, mär'chant, James (1867–). An English reformer. From 1889 to 1894 he was evidential lecturer to the Bishop of St. Albans and then preached in Trinity Presbyterian Church, London, in 1895–97, and at St. Andrew's, Chatham, in 1900–02. In 1903–06 he was secretary of Dr. Barnardo's Homes and with Mrs. Barnardo he edited *The Memoirs of Dr. Barnardo* (1907). Becoming greatly interested in hygienics and eugenics, in 1911 he was consecrated for the work of public morals in Westminster Abbey by the Lord Bishop of Durham and F. B. Meyer; and he became director of the National Council for Race Regeneration and editor of *Prevention*, an organ of the movement. He wrote: *Theories of the Resurrection* (1899); a *Life of Dr. Paton* (1909); *The Nation's Morals* (1910); a sketch of A. Russel Wallace in Wallace's *Revolt of Democracy* (1913); *The Master Problem* (1915).

MARCHANTIA, mär-kăn'shĭ-ȧ. One of the bryophytes (q.v.).

MARCHANTIALES, mär-kăn'shĭ-ā'lēz. See Hepaticæ.

MARCHE, Albert Lecoy de La. See Lecoy de La Marche, Albert.

MARCHENA, mär-chā'ná. A town of south Spain in the Province of Seville, situated 28 miles east of Seville, on the railroad between Cadiz and Cordova (Map: Spain, C 4). It is a picturesque old town, partly surrounded by the grass-covered remains of Moorish fortifications, and contains a half-ruined palace of the dukes of Arcos (within the close of which is an old Moorish building) and two notable Gothic churches. In the neighborhood are sulphur springs. The surrounding region is fertile, growing fine olives. Pop., 1900, 12,255; 1910, 13,590.

MARCHENA RUIZ DE CASTRO, rōō-ēth' dȧ käs'trō, José (1768–?1821). A Spanish author and journalist, who studied the humanities at the University of Seville, took minor orders, and was for a while professor at the seminary of Vergara. Having been strongly influenced by the theories of the French philosophers, his writings became such that he had to escape to France in order to avoid arrest by the Inquisition in 1792. In France he became intimate with persons of influence, continued his writings, was expelled from France in 1799, declared himself a Bonapartist in 1804, accompanied Murat to Spain in 1808, and was imprisoned by the Inquisition and released by Joseph Bonaparte, who appointed him editor of the *Gaceta*. From 1813 to 1820 he was again an exile. In his day Marchena was one of the best Latinists in the world. As an amusement he published at Strassburg in 1800 what he claimed was a fragment of Petronius' *Cena Trimalchionis* that he had found. After the Latinists of the world had admitted that they could find no fault with the text, ex-

cept his refusal to show the original he claimed to have found and copied, Marchena acknowledged that he had written it himself.

MARCHES, The (It. *Le Marche*, the boundaries). A name frequently occurring in Italian history as applied to a stretch of territory in the central part of the peninsula, comprising the present provinces of Ancona, Ascoli-Piceno, Macerata, and Pesaro e Urbino (Map: Italy, D 3). The use of "marches" for waste land separating two tribes where the need of rigid boundaries is not felt was common in mediæval Europe.

MARCHESA COLOMBI, mär-kā′zȧ kŏ-lŏm′bē. A pseudonym of the Italian author Maria Torelli-Torriani (q.v.).

MARCHESI, mär-kā′zē, Mathilde, *née* Graumann (1826–1913). A German-French singing teacher, born at Frankfort-on-the-Main. She studied under Nicolai in Vienna and with Manuel García in Paris, afterward appearing as a concert singer in London and on the Continent. Her voice was pleasing but not remarkable. In 1852 she married Signor Salvatore Marchesi (q.v.) and taught singing at the Vienna Conservatory from 1854 to 1861, after which she moved to Paris and succeeded in making her salon one of the most important circles of musical life in the city. She taught at Cologne from 1865 to 1868, then at Vienna for a number of years, but ultimately settled in Paris. She published an *Ecole de Chant* and 24 books of *Vocalises*. In English appeared *Ten Singing Lessons* (1901). Among her pupils were Tremelli, Caroline Sulla, Emma Schuk-Proska, Gerster, Melba, Eames, Calvé, Sibyl Sanderson, and her own daughter Blanche, who afterward sang, especially in opera, in England and on the Continent. Consult the autobiographical *Marchesi and Music: Passages from the Life of a Famous Singing Teacher*, with introduction by Massenet (New York, 1897).

MARCHESI, Pompeo Cavaliere (1789–1858). An Italian sculptor. He was born at Saltrio, near Milan, and studied at Rome under Canova. He was for many years professor of sculpture at the Academy of Milan. Some early and rather clumsily executed statues by him are in Como Cathedral, which also contains a relief of the "Death of St. Joseph," his latest and one of his most admired works. He contributed largely to the decoration of the Arch of Peace at Milan, the relief commemorating the "Battle of Leipzig" and "Drowning of Prince Poniatowsky" deserving special mention. His later works include the sitting statue of Goethe for the Frankfort Library, a statue of Emperor Francis I of Austria for Graz, and another for the Hofburg in Vienna. One of his largest but not most pleasing works is the colossal group for the church of San Carlo at Milan, in which is the figure of the famous "Mater Dolorosa." The excessive sentimentality which characterizes most of his religious compositions is particularly visible here. Much better is the sepulchral monument for Duke Emmanuel Philibert of Savoy (1843) in the Turin Cathedral.

MARCHESI, Salvatore (1822–1908). A celebrated Italian barytone and singing master, born at Palermo. He was a nobleman, his full title being Cavaliere di Castrone, Marchese della Rajata. While studying law and philosophy at Palermo he also had his voice cultivated by Raimondi. In Milan he continued his musical studies under Lamperti and Fontana. Because of participation in the revolution of 1848 he had to flee, and came to America. His operatic début made in New York, he went to London for further study under García. After his marriage to Mathilde Graumann, who later became famous as Madame Marchesi, he and his wife appeared with great success in concert and opera in England and on the Continent. In 1854 both accepted positions at the Vienna Conservatory, but soon went to Paris. In 1865 they were called to the Cologne Conservatory, and in 1869 once more to Vienna. From 1881 to his death he resided in Paris. He wrote a number of successful songs, vocalises, and a *School for Singing*.

MARCHFELD, märk′fĕlt. A large plain on the north bank of the Danube, opposite Vienna. It is bounded on the east by the river March. It contains only a few villages. Because of the physical characteristics this has been a noted battlefield. Here Marcus Aurelius contended with the Marcomanni. In 1260 King Ottokar of Bohemia defeated Béla IV of Hungary on the Marchfeld. On the same plain in 1278 Ottokar was defeated by Rudolph of Hapsburg and slain. In modern times the most important battles fought on the Marchfeld were those of Aspern (q.v.) and Wagram (q.v.) in 1809.

MARCH FLY. Any one of the dipterous insects of the family Bibionidæ, so called because these flies are most common in the early spring. They are of medium size, rather thick-bodied and rather hairy, but they are weak fliers. The wings are frequently fuscous. More than 300 species are known. The larvæ feed upon excremental or vegetable substances and are supposed to attack the roots of growing grass. The larvæ of some species have been found on the surface of snow. One of the commonest species in the United States is the white-winged bibio (*Bibio albipennis*), which sometimes occurs in enormous numbers. The smallest forms belong to the genus *Scatopse* and breed in decaying animal and vegetable matter.

MARCHIENNE-AU-PONT, mär′shĕ′ĕn′ō′-pŏn′. A town in the Province of Hainault, Belgium, 2 miles west of Charleroi, on the Sambre River (Map: Belgium, C 4). It is an important coal-mining centre, has an industrial school and manufactures of iron, machinery, and glass. Pop., 1900, 18,461; 1910, 21,635.

MARCH′ING. General Principles. A successful march, whether in peace or war, is one that places the troops at their destination at the proper moment and in the best possible condition. In war marches are of daily occurrence, and success depends in a great measure upon the skill with which they are conducted. Good marching is secured by careful preparation, strict discipline, and the due observance of march sanitation. While conforming to other requirements, marches are conducted so as to reduce to a minimum the hardships of the troops. When possible ample notice is given so that preparations can be made without haste. The march is habitually at route order. Troops are informed of the length of halts so that they can take full advantage of the same. The men are not kept under arms longer than necessary, nor required to carry heavy burdens when transportation is available. Special care is paid to the feet of the men and to the hoofs and backs of animals. In prolonged marches at least one day in seven should be a day of rest. A forced march is never undertaken unless the situation requires it. As a rule troops on the march pay no compliments; individuals salute

when they address, or are addressed by, a superior officer. The conduct of a march (forming the column or columns, distribution of troops, start, rate, length of march, etc.) is controlled by the situation and object to be accomplished. *Forming the Column.*—To form the column a "march order" is issued by the superior commander. This order states the object of the march, gives the distribution of the troops, order of march of the main body, and the manner of forming the column. In drafting such orders the road space and rate of march of the different fractions of the command and their distances from the *initial point* must be considered. With foot troops and cavalry marching four abreast, artillery and trains in single column of carriages, the following may be assumed for approximate calculations: two men per yard for foot troops, one man per yard for each mounted man, 20 yards for each gun, caisson, or wagon, and 12 yards for each auto truck. *Distribution of Troops.*—The order of march of a column is controlled mainly (1) by tactical considerations, which are paramount in the presence of the enemy, and (2) by the rule requiring the hardships of troops to be reduced to a minimum. During an advance the order of march of a column is generally as follows, the necessary security being provided: combatant troops (with combat trains): 1, cavalry and horse artillery; 2, infantry and light or mountain artillery; 3, engineers and signal troops; 4, trains, etc. During a retreat this order of march is reversed. A detachment of engineers marches near the head to repair bridges, etc. Infantry usually marches in column of squads, column of twos when necessary; cavalry in column of fours on good roads, otherwise in column of twos; artillery in section or double-section column, depending on the width of the road. *The Start.*—When practicable, marches begin in the morning, ample time being allowed for the men to breakfast, animals to feed, and the animals and wagons to be packed. Foot troops do not start before broad daylight; mounted troops, when practicable, about an hour after broad daylight. Too early a start is inadvisable, as both men and animals rest better in the early morning hours.

Rate and Length of Marches. The rate of march of a mixed command is regulated by that of the foot troops. For *infantry* the rate prescribed for *drill* is 100 yards a minute or 3.4 miles an hour; *on the road* the maximum to be counted on is 88 yards a minute or 3 miles an hour; including halts this rate is reduced to 2½ to 2¾ miles. The rate of infantry columns under average road conditions may be assumed at 2¼ to 2½ miles per hour. The average march of infantry is 15 miles a day; large bodies, 12 miles. Small bodies under favorable conditions may average 20 miles. For *cavalry* the *drill* rate is: walk, 4 miles; trot, 8 miles; gallop, 12 miles per hour. The average walk of a horse is at the rate of a mile in 16 minutes, or 3¾ miles an hour; the average trot a mile in 8 minutes, or 7½ miles an hour. *In the field* the usual gait is the walk of 3¾ miles per hour; including halts, 3¼ to 3½ miles per hour. The average march of cavalry, after men and animals are hardened, is 25 miles a day.

The daily march of *field artillery* is the same as that of the command of which it forms a part; if alone, it covers from 15 to 20 miles.

The rate of a *wagon train* under average conditions in long columns is about 2 miles per hour, including halts. Small trains may make 2½ miles. The daily march is the same as infantry.

The average load of a *pack mule* is 250 pounds, and thus loaded a pack train can travel 20 to 25 miles a day over ordinary roads; over rough country, 10 to 15 miles. The rate of auto trucks varies with the road and truck. *Halts.*—As a rule infantry halts 15 minutes after the first three-quarter-hour march; thereafter 10 minutes every hour. Cavalry 5 minutes every hour. Artillery from 5 to 10 minutes.

Marches may be classified as follows: 1. *Marches in peace*, which include changing station and practice marches. 2. *Marches in campaign*, which include concentration marches, marches in the presence of the enemy, forced marches, and night marches. In *changing station* marches are conducted almost solely with reference to the comfort of men and animals and facility of supply and camping, as such marches do not involve tactical considerations. *Practice marches* have for their purpose hardening the men and animals and instructing officers and men in campaign duties. *Concentration marches* assemble at a certain time and place bodies of troops from different localities. Computation of time and road space is important. *Marches in the presence of the enemy* are controlled solely by tactical considerations, and require the use of certain troops, for information and security, disposed as advance, flank, and rear guards, for the protection of the main body of troops. If the command is a division the following is a not unusual disposition: *advance guard*, consisting of one brigade of infantry, all of the divisional cavalry, one battalion of artillery, one company of engineers, a detachment of signal troops, and a detachment of the sanitary train. Following this, with a distance of from ½ to 1 mile, is the *main body*, in order of march as follows: one regiment infantry, one battalion of artillery, a regiment of artillery, two brigades infantry (less one regiment), engineers, signal troops, artillery combat trains, trains. A division at war strength consists of 22,000 men, 7500 animals, and 900 vehicles. With its field trains, closed up without distance, a division will occupy about 12 miles of road.

Forced Marches are not made unless absolutely necessary, as they seriously impair the fighting power of the best troops. A maximum day's march of infantry and trains is about 28 to 30 miles. Such a march should not be prolonged more than 36 hours. Under favorable conditions cavalry and field artillery may march at a rate of 50 miles in 24 hours for three or four days. Under very favorable conditions a *single* march of 100 miles can be made in from 24 to 30 hours.

Night Marches are sometimes made in hot weather, but usually to surprise the enemy or to secure a favorable position to attack at night or at dawn. Special precautions must be taken to keep the units in touch and in the proper roads or trails. If secrecy is required special instructions are given with regard to smoking, lights, talking, etc. Cavalry follows infantry; the artillery is in rear with a special infantry escort.

French infantry has always had a reputation for rapid marching. In June, 1914, the 166th regiment of (fortress) infantry marched 55.8 miles in 36 hours without having a man drop out. During former Indian campaigns troops

and squadrons of United States cavalry were credited on their records, on more than one occasion, with a distance of 110 miles in 24 hours. Consult *Field Service Regulations, United States Army* (Washington, 1914).

MARCHING THROUGH GEORGIA. A widely popular ballad of the Civil War, beginning "Bring the good old bugle, boys." It commemorates Sherman's famous march to the sea and was written by H. C. Work soon after the march commenced, on Nov. 16, 1864.

MARCHIONESS, märʹshŭn-ĕs, THE. In Dickens's *Old Curiosity Shop,* a small servant to Sampson Brass, and a friend of Dick Swiveller.

MARCHMONT, märchʹmont, ARTHUR WILLIAMS (1852–). An English novelist, born at Southgate, Middlesex, and educated privately and at Pembroke College, Oxford. In 1888 he entered Lincoln's Inn. Up to 1894 he devoted himself to journalism in London and the provinces, editing at one time the *North Eastern Daily Gazette* and later the *Lancashire Daily Post* and contributing constantly to reviews and magazines. In 1894 journalism was abandoned for fiction, in the production of which this author was prolific; witness, among others, the novels: *Isa* (1887); *By Right of Sword* (1897), dramatized, and produced in America (1902); *Sarita the Carlist* (1902); *The Queen's Advocate* (1904); *The Man who was Dead* (1907); *An Imperial Marriage* (1909); *In the Name of the People* (1911); *The Mystery of Eagrave Square* (1912); *When Love Called* (1913); *The Heir to the Throne* (1914).

MARCIANISE, märʹchä-nēʹzä. A town in the Province of Caserta, Italy, 18 miles by rail from Naples, in a low, unhealthful plain, where are several small lakes. Weaving of flax and hemp and the raising of fruits and grain constitute the principal industries. Pop. (commune), 1901, 12,785; 1911, 13,465.

MARCIL, märsēlʹ, CHARLES (1860–). A Canadian journalist and statesman. He was born at Ste. Scholastique, Province of Quebec, was educated at Ottawa College, and in 1879–81 was on the staff of the Montreal *Gazette.* He was with the Montreal *Herald* (1882–86), the Montreal *Post* (1886–96), and afterward with *La Patrie* and the *Star,* of the same city. He was an unsuccessful Liberal candidate for the Quebec Legislative Assembly (1897), but was elected to the House of Commons for Bonaventure in 1900. He became Deputy Speaker of the House in 1905, and was Speaker thereof in 1909–11. In 1911 he was appointed a member of the King's Privy Council for Canada, and in the same year was made an honorary vice president of the Universal Races Congress at London, England. He acquired a wide reputation as a public speaker.

MARCION, märʹshon. A second-century Christian, classed among the heretics. He was born in Sinope, Pontus, and died after 160. About the year 140 he came to Rome, where he fell under the influence of the Syrian Cerdo (see CERDONIANS), from whom his Gnostic ideas were perhaps derived, and here he founded his church. He afterward traveled through the East, visiting Rome again in the episcopate of Anicetus (154–165). Nothing is known of his later life. His disciples, chief among whom was Apelles, continued his work, and Marcionite churches were soon to be found scattered over north Africa, Gaul, Asia Minor, and Egypt.

It is said that Polycarp (q.v.) once met Marcion in the streets of Rome and saluted him as "the first-born of Satan." In this he gave expression to the general sentiment of the Church, for Marcion was attacked by almost every orthodox writer from Justin onward. Yet Marcion regarded himself in the light of a reformer. He believed that Christianity marked an essentially new departure, but that it had already become corrupted through the admixture of Jewish elements. These must be purged out. For him Paul was the only true Apostle, because he alone thoroughly abjured Judaism. These principles appear in Marcion's Scripture canon—the earliest Christian collection known—which embraced one Gospel (Luke, without the story of the infancy, which was "Jewish") and 10 of Paul's Epistles (omitting those of Timothy and Titus). Church writers accused him, with apparent justice, of "mutilating" the Scriptures. His own chief work, entitled *Antitheses,* set forth the alleged contradictions between Law and Gospel. The Creator of the Old Testament was represented as a cruel and vindictive being, wholly different from the God of love revealed through Christ. Marcion's Christology was docetic, i.e., he taught that Christ suffered only in appearance, for neither suffering nor a material body could be supposed of the Divine. (See DOCETÆ.) Since matter was regarded as evil, his ethics resulted in a severe asceticism. His Gnostic tendency appears in the dualistic tenet that man's body cannot be saved, only his spirit, which is the opposite of matter. This was a striking departure from the common Christian belief. An attempt has recently been made to prove that the old Roman symbol, which lies at the basis of the Apostles' Creed, was formed to combat Marcion's Gnosticism. The Marcionite church was completely organized, having its clergy, its rites, and its Scriptures. The sacrament of baptism was administered much as in the orthodox Church, but in the Eucharist water was substituted for wine. In the East Marcionite churches are found as late as the sixth century, but in the West they disappeared earlier, being absorbed by the more virile Manichæans. (See MANICHÆISM.) Their downfall was due in part to ecclesiastical opposition and in part to hostile legislation under Christian emperors from Constantine onward. In the persecutions through which they passed not a few Marcionites suffered a martyr's death, and the property of their churches was declared forfeited to the Catholic church. Consult, for information as to the surviving fragments of Marcion's works, C. T. Cruttwell, *Literary History of Early Christianity* (London, 1893), and Gustav Krüger, *History of Early Christian Literature* (New York, 1897). Among the sources, consult the interesting work of Tertullian, *Against Marcion,* translated in *The Ante-Nicene Fathers,* vol. iii (New York, 1905). In general, consult: Adolf Harnack, *History of Dogma,* vol. i (Boston, 1894), and Wace and Piercy (eds.), *Dictionary of Christian Biography and Literature* (ib., 1911).

MARCKE, EMILE VAN. See VAN MARCKE, EMILE.

MARCKS, ERICH (1861–). A German historian, born in Magdeburg and educated at the Gymnasium there and in the universities of Strassburg, Berlin, and Bonn and in Paris and London. He was docent at Berlin (1887–92) and became professor of modern history at Freiburg (1892), Leipzig (1894), Heidelberg (1901),

Hamburg (1907), and Munich (1913). At Leipzig he was an editor of *Leipziger Studien aus dem Gebiet der Geschichte.* With the exception of an incomplete biography of Coligny (1892), a study of Queen Elizabeth of England (1897), and some local historical works, Marcks's published books deal with modern personages and problems, especially in Germany and England. They include: *Kaiser Wilhelm I.* (1897; 7th ed., 1910); estimates of Ludwig Häusser (1903) and of Treitschke (1906); several volumes on Bismarck, notably the first volume of a biography (1909); *Deutschland und England* (1900; also in English as *England and Germany*, 1900); *Die imperialistische Ideen in der Gegenwart* (1903); *Biographical Essays* (1905–08); *Einheitlichkeit der englischen Auslandspolitik* (1910); the popular *Männer und Zeiten* (1911); *Historische und akademische Eindrücke aus Nordamerika* (1913).

MARCO BOZZAR'IS. A well-known poem by Fitz-Greene Halleck on the death of the Greek patriot Bozzaris (q.v.). It appeared in the *New York Review* in 1825.

MARCO DA OGGIONE, mär'kō dä ŏd-jō'nâ. An Italian painter. See OGGIONE, MARCO DA.

MAR'COMAN'NI (Lat., from OHG. **Markaman*, border man, from *marca*, border + *man*, man). An ancient German people who, in the time of Cæsar, lived along the banks of the Rhine, but afterward, as appears from Tacitus and Strabo, settled in Bohemia, from which they expelled the Boii. Their King, Maroboduus, entered into an alliance with the tribes living around them to defend Germany against the Romans. The combined forces of the alliance numbered 70,000 men, and the Emperor Tiberius signed a treaty with them in 6 A.D.; but the Marcomannic alliance was defeated 11 years later by the Cherusci and their allies; and in 19 the Gothic Catualda drove Maroboduus from the throne and himself usurped the sovereignty. But he was soon overthrown and the native dynasty established, under whose rule the Marcomanni extended their territory up to the Danube, till their encroachments alarmed the Romans, who attacked them in the time of Domitian. This war, which subsided for a time in the reigns of Trajan and Hadrian, broke out again under Marcus Aurelius, and was carried on with bitterness from 166 to 180, when it was ended by the Peace of Commodus. The Marcomanni continued to make raids into the provinces of Noricum and Rhætia, and in 270 invaded Italy as far as Ancona. In the fourth century their name fades away from history; it has been held that the Marcomanni were merged with the Boiarii or Baiouarii, later known as the Bavarians. See BAVARIA, *History.*

MARCONI, mär-kō'nē, GUGLIELMO (1874–). An Italian electrical engineer, inventor of the wireless telegraph. He was born of an Italian father and an Irish mother at Bologna, April 25, 1874. After study under Rosa at Leghorn he entered the University of Bologna. There he came in contact with Professor Righi, who had long been interested in the nature of the Hertzian waves. The young man saw the possibilities of using these waves for the transmission of messages, improved the coherers of Onesti and Branly, made several successful experiments at Griffone in 1895, and in 1896, having failed to interest the Italian government in his behalf, went to England, where his plans were laid before the post-office authorities. There his project was well received and successful tests were made between Penarth and Wiston. Sir William Preece, engineer in chief of the British telegraph system, who had himself made experiments in 1893 and 1894, took up the new method, tested it, and declared it successful, but limited in application. Almost immediately afterward tests of the Marconi method were made by the Italian Ministry of Marine at Spezzia. In 1897 the Marconi Wireless Telegraph Company, Limited, was founded and two years later signals were successfully exchanged across the English Channel, and the system was established pretty generally in the British and Italian navies, although at the time some insular jealousy was aroused in England that the scheme of a foreigner should be adopted in view of Preece's early study of the problem.

In December, 1901, Marconi sent signals to Newfoundland from his station at Poldhu on the coast of Cornwall, and on Dec. 19, 1902, he succeeded in transmitting messages between Poldhu and the permanent station erected at Glace Bay, Nova Scotia, this being the first occasion of the transatlantic transmission of wireless messages. Previously, however, in February, 1902, Marconi had been able to maintain communication between the transatlantic steamship *Philadelphia* and Poldhu for a distance of 2099 miles in the case of test letter signals and for 1551 miles for actual messages. These experiments proved the possibility of constant long-distance communication between vessels at sea and the mainland, as well as the general advance of the art. By 1903 Marconi was able to begin the transmission of news messages between America and Great Britain for the London *Times*, and during the same year continuous communication was maintained between land and the steamship *Lucania* during her entire crossing, so that news messages could be supplied to the vessel. Similar communication was maintained between Poldhu and the British warship *Duncan.* By 1904 over-sea transmission was developed to a point of efficiency and reliability, so that a daily newspaper containing the news of both Europe and America could be published on the vessels of the Cunard line. In 1907 a limited commercial service across the Atlantic for public use was established, and from that time its use increased without, however, making any serious inroads into the business of the submarine telegraphs. In the meantime his experimental work continued and he invented a directive system of wireless, as well as a new persistent wave system, which was brought out in 1906. The underlying physical considerations were studied and apparatus—notably new detectors and generators giving the form of wave desired—was evolved which increased the efficiency of the transmission and reception of messages.

About 1910 Marconi brought out a new valve receiver and a new electrolytic detector. He also developed about this time a duplex system by which the sending and receiving devices are rendered operative and inoperative alternately in rapid succession, avoiding synchronism at the two stations. By this time the Marconi Company had developed its transatlantic service on a practical basis, and its station in Argentina was able to receive signals from Nova Scotia and from Ireland, a distance of 5600 miles, which was extended to other South American stations, making an aggregate of 7000 miles.

The promotion of the Marconi companies both

in Great Britain and in the United States was not free from unfavorable comment. In fact, in 1912 charges were made that Premier Asquith, Chancellor Lloyd George, and other members of the British cabinet had corruptly favored the Marconi Wireless Telegraph Company and had benefited through speculation in its stock. The subject was investigated by a parliamentary committee and in May, 1913, Marconi was placed on the stand. He replied vigorously to the various charges and insinuations both technical and commercial. No general blame attached to him in this connection and the cabinet members were regarded as having been only indiscreet, but for the time being the incident was conspicuous in British politics.

On May 1, 1913, an advisory committee of Parliament reported that the Marconi system alone was certainly capable of meeting the requirements for the Imperial wireless chain, but that the company need not be employed as contractors for all the work, and that it was not necessary to employ exclusively the apparatus of the company then in use, as further developments might be reasonably expected. In the meantime the business of the Marconi system had developed broadly and it was employed generally on the vessels of the British merchant marine and at various colonial stations, as well as throughout the United Kingdom. When Italy entered the European War (June, 1915), Marconi took charge of the wireless for his government. He was decorated with the Russian Order of St. Anne, the Italian Order of St. Maurice and St. Lazarus, and with the Grand Cross of the Crown of Italy; and he received the freedom of the city of Rome (1903). In 1904 Oxford and Glasgow gave him honorary degrees; he became a Chevalier of the Civil Order of Savoy (1905); received the Grand Cross of the Order of Alphonso XII; and with Ferdinand Braun shared the Nobel prize for physics (1909). He received the British G.C.V.O. in 1914 and in the next year was nominated a Senator of the Kingdom of Italy. See WIRELESS TELEGRAPHY.

MARCO POLO. See POLO, MARCO.

MARCOS, FRAY. See NIZA, MARCOS.

MARCOT, mär'kō', JEAN BAPTISTE ANTOINE MARCELIN, BARON DE (1782–1854). A French soldier, born at La Rivière, Corrèze. He left the Collège de Sorèze in 1799; served in the Republican army in Italy under his father, Gen. Jean Antoine Marcot; and was rapidly promoted until he became aid-de-camp to Marshal Augereau in the Russian and Prussian campaigns of 1806–07. He was with Lannes and Massena in the Peninsular War, and in 1812–13 was colonel of light cavalry in the Russian and German campaigns. During the Hundred Days he served as a general of brigade under Napoleon, and for this was exiled upon the Second Restoration. He returned to France in 1819; became a maréchal de camp in 1830 and a lieutenant general in 1836; was made a peer of France in 1845; and retired in 1848.

MARCOU, mär'kōō', JULES (1824–98). A French geologist, born in Salins in the Department of Jura. He was educated in Paris and, after completing his course at the Collège St. Louis, made geological excursions through the Alps. In 1846 he was attached to the mineralogical department of the Sorbonne and conducted geological investigations in various parts of Europe and from 1848 to 1850 in the United States and Canada. In 1853–54 he was employed by the United States government in surveying the Rocky Mountains, but he returned in 1855 to Europe to accept the chair of paleontological geology in the Polytechnic School of Zurich. In 1860 he again visited the United States and was engaged with Prof. Louis Agassiz in paleontological researches, and afterward entered the government service. He died at Cambridge, Mass. He published two fine geological maps, one of the United States in 1853, another of the world in 1862 (2d ed., 1875). Marcou became best known, perhaps, for his *Recherches géologique sur le Jura salinois* (1848) and *The Taconic System and its Position in Stratigraphic Geology* (1885). He published many scientific papers besides the following more extended works: *Geology of North America* (1858); *De la science en France* (1869); *Origin of the Name America* (1875); *First Discoveries of California, and the Origin of its Name* (1878).

MARCOUX, mär'kōō', JOSEPH (c.1770–1855). A Canadian missionary. He was born in Canada, was educated for the Catholic priesthood, after his ordination was sent as a missionary to the various Iroquois tribes, and in 1819 settled among them at Caughnawaga, on the south shore of the St. Lawrence River. His persevering labors resulted in imparting a considerable degree of civilization to the Indians, and he built a schoolhouse and church at Caughnawaga for their benefit. He became a master of the Iroquois language, of which he wrote a grammar and dictionaries. He also published in that language: *The Life of Christ; Letters to Iroquois Chiefs* (1848–49); *Prayer Book* (1852); *Catechism* (1854).

MARCOUX, VANNI (1879–). A French basso, born at Turin, Italy. Having received a liberal education, he was admitted to the bar and began to practice law; but, as his musical talent showed itself early, he also devoted much time to the serious cultivation of music, studying with Collino of Turin and later with Boyer at Paris. At his début in Paris he immediately attracted attention because of his striking and quite exceptional power of characterization. From 1905 to 1912 he appeared every season at Covent Garden in London. In 1912 he became a regular member of the Boston Opera Company. His repertory is very extensive, including almost all the important rôles in older and modern French and Italian operas. He created the title rôle in Massenet's *Don Quichotte.*

MAR'CUS, SAINT. Bishop of Rome, or Pope, Jan. 18 to Oct. 7, 336. He was a native of Rome and is said to have had a share in the building of two churches, one of which still remains as San Marco, although frequently altered and repaired.

MAR'CUS AURE'LIUS ANTONI'NUS. See AURELIUS.

MARCUS AURELIUS CLAUDIUS. See CLAUDIUS II.

MARCUS AURELIUS OLYMPIUS NEMESIANUS. See NEMESIANUS.

MAR'CY, MOUNT. The loftiest of the Adirondack Mountains and the highest point in New York State, situated in Essex Co., 10 miles south of Lake Placid (Map: New York, G 2). It is 5344 feet high and was known to the Indians as *Tahawus,* the "cloud divider." Within a few miles of it are many other famous Adirondack peaks, such as McIntyre Mountain (5112 feet), Mount Skylight (4920 feet), Mount Hay-

stack (4918 feet), Basin Mountain (4825 feet), Mount Redfield (4606 feet), and Saddleback Mountain (4530 feet).

MARCY, Henry Orlando (1837–). An American surgeon, born at Otis, Mass. In 1863 he volunteered in the Union army as assistant surgeon. He was assistant in chemistry at Harvard after the close of the war; then studied surgery at Berlin (1869) and in England under Lister, and devoted himself especially to the bacteriology of wounds. He was president of the American Academy of Medicine in 1884, and of the American Medical Association in 1892. Marcy wrote *Best Methods of Operative Wound Treatment* (1882), *The Perineum: Its Anatomy and Surgical Treatment* (1889), and the very valuable work *Anatomy and Surgical Treatment of Hernia* (1892).

MARCY, Randolph Barnes (1812–87). An American soldier, born at Greenwich, Mass. He graduated at West Point in 1832. He was assigned to the United States regular infantry, and was chiefly engaged against the Indians until the outbreak of the Mexican War, for his services in which he was promoted captain (1846). Subsequently he was engaged in explorations in the Red River country (1852), in operations against the Seminoles (1857), and in the Utah expedition of 1857–58. He was appointed paymaster, with the rank of major, in 1859, and inspector general, with the rank of colonel, in 1861. During the Civil War he was chief of staff to General McClellan (his son-in-law), in West Virginia, on the Peninsula, and in Maryland; and in 1865 was brevetted major general in the regular army for faithful and meritorious services during the war. In 1869, after performing inspection service in a number of military departments and as inspector general of the military division of Missouri, he was appointed inspector general of the United States army, with the rank of brigadier general, and was president of the Army Regulation Board until Jan. 1, 1881, when he retired from active service. He contributed largely to magazines, and published: *Exploration of the Red River* (1853); *The Prairie Traveler* (1859); *Thirty Years of Army Life on the Border* (1866); *Border Reminiscences* (1871).

MARCY, William Learned (1786–1857). An American statesman, born Dec. 12, 1786, at Southbridge, Mass. He graduated at Brown University in 1808 and entered upon the practice of law at Troy, N. Y., in 1810. At the opening of the War of 1812 he entered the volunteer service as a lieutenant, and on Oct. 22, 1812, led a successful attack upon St. Regis, a Canadian post. For this he was soon afterward promoted to be captain. Before the end of the war he returned to Troy, where he was active as a newspaper writer and politician, supporting the Tompkins faction against the Clintonians, and allying himself with the "Albany Regency" (q.v.). After filling several minor offices, and after a service of six years as Comptroller of the State, he was made an associate justice of the New York Supreme Court in 1829. In 1831 he was elected Senator of the United States by the Democratic party, but resigned the office upon being chosen Governor of New York in 1832. In the Senate he served as chairman of the Judiciary Committee, and gained distinction by his defense of Martin Van Buren against the attacks of Henry Clay. In the course of a speech on the question of appointment to office he upheld the right of the President to bestow the offices upon his political supporters, saying, "We can see nothing wrong in the maxim that to the victors belong the spoils," thus associating his name in history with the spoils system. He was, however, much more than a spoilsman: "he was a hard-headed, aggressive Democratic partisan, with none of the popular power of his younger rival, Douglas, but with much more caution and political shrewdness." He served as Governor for three terms, and was nominated for a fourth term in 1838, but was defeated by William H. Seward (q.v.). He was then appointed a commissioner on claims against the Mexican government, serving in that capacity until 1842. In 1845 he became the Secretary of War in President Polk's cabinet. His ability in this position was severely tested by the Mexican War. In the presidential campaign of 1848 he supported General Cass. The last and most important public station in which he served was that of Secretary of State during Pierce's administration (1853–57). Among the foreign complications or treaties which demanded action on his part in this capacity were the settling of the Mexican boundary, the Canadian reciprocity treaty, Commodore Perry's negotiations with Japan, the British fishery dispute, the Ostend Conference, and the so-called Koszta Affair (q.v.), which added much to his popularity. In these and in other matters Marcy successfully defended the interests of his country and displayed the qualities of a trained statesman and accomplished diplomat. One of his notable diplomatic papers was his instructions to the American ministers abroad to appear at court "like Franklin in the simple costume of an American citizen" when this could be done without detriment to the interests of the United States. Marcy's death occurred at Ballston Spa, N. Y., but a few months after the expiration of his term of office. He is entitled to high rank as a statesman, while as a shrewd politician he was at his time almost unsurpassed. Consult: J. S. Jenkins, *Lives of the Governors of the State of New York* (Auburn, 1851); J. F. Rhodes, *History of the United States from the Compromise of 1850*, vols. i and ii (New York, 1892); S. Webster, "Mr. Marcy, the Cuban Question, and the Ostend Manifesto" in vol. iii of the *Political Science Quarterly* (ib., 1893); De A. S. Alexander, *Political History of the State of New York* (ib., 1906).

MARCZALI, mär'tsä-lē, Henry (1856–). A Hungarian historian, born in Marczali, County Somogy. He was educated at the University of Budapest and, after studying in Berlin, Paris, and London, became lecturer (1880) and professor (1895) of the Historical Seminary of the University at Budapest. He contributed to the great millennial history (in Magyar) of Hungary (1895–1901), edited by Szilagyi; and himself published: *Ungarns Geschichtsquellen* (1882–88); *Hungary in the Times of Joseph II* (1891); *Mary Theresia* (1900–04); *Enchiridion Fontium Historiæ Hungariorum* (1902), in Latin and Magyar; *Hungary in the Eighteenth Century* (1910); *Ungarische Verfassungsgeschichte* (1910); *Ungarisches Verfassungsrecht* (1911).

MARDI GRAS, mär'dē' grä'. See Carnival.

MARDIN, mär-dēn'. The capital of a sanjak in the Vilayet of Diarbekir in north Mesopotamia, Asiatic Turkey (Map: Turkey in Asia, D 3). It is strikingly situated on the steep slopes of a conical hill 5000 feet above sea

level, crowned by the ruins of an old castle. It has a number of mosques, bazars, and baths, as well as Christian churches and monasteries, and is the seat of an important American mission with a church and a school. It is also the seat of the Jacobite Patriarch of Antioch, who occupies an ancient and interesting monastery not far from the city. It is also the headquarters of a Roman Catholic archbishop. Pop., about 25,000, of whom less than one-half are Moslem Kurds; the rest are Christians of various Eastern sects.

MARDO'NIUS (Lat., from Gk. Μαρδόνιος, *Mardonios*, from OPers. *Marduniya*). A Persian general, son of Gobryas and son-in-law of Darius Hystaspes. In 492 B.C. he commanded an expedition sent out by Darius to punish the Eretrians and the Athenians for the aid they had given to the Ionians. (See GREECE, *Ancient History*.) Near Mount Athos, however, his fleet was destroyed by a storm, and when, shortly afterward, his land forces were cut to pieces, he returned to Asia and was relieved of his command by Darius. On the accession of Xerxes he was restored to favor and was appointed one of the generals of the expedition against Greece. After the battle of Salamis (480 B.C.) he was left by Xerxes with 300,000 men to conquer Greece. In the following year, 479 B.C., he was defeated and probably slain in the battle of Platæa, by the Greeks under Pausanias. Consult Herodotus, vi, 43–45, 94; vii, 5, 9, 82; viii, 100 et seq., 113 et seq., 133–144; ix, 1–4, 12–15, 38–65, and the editors on these passages. Consult also the standard histories of Greece.

MAR'DUK. See MERODACH.

MARDUK, mär'dōōk. The chief god of Babylon. An older form of the name seems to have been *Maruduk*. He was manifestly a Sumerian divinity. Since he is represented as a son of Ea, the god of Eridu, it is possible that a dynasty of Eridu established itself in Babylon between the dynasty of Uruk and Ur Engur of Ur, with Marduk as its chief god. For some centuries previous to this the city probably had a prevailingly Akkadian population, as the Semitic god Nabu appears to have established for himself so strong a position that it had to be recognized even in later times. With the growth of Babylon the importance of its great god increased. When Hammurapi's conquest of Larsa, made in 2094 B.C., made it the capital of all Babylonia, Marduk naturally tended to become the head of the Babylonian pantheon, and he was greeted as "King of the gods," "King of heaven and earth," "Lord of lords, king of kings." The Semitic population also seems to have called him Bel, he is addressed as Bel at the end of the Code of Hammurapi and elsewhere, and hence the Hebrews also spoke of him as Bel or Bel Merodach (q.v.). In Eridu Marduk seems to have been a sun god, and it was probably there that the myth developed according to which he became the creator of the present world and of mankind after his conquest of the chaos monster Tiamat. This myth spread from Babylon to Assyria and even to Syria. In the city of Assur this mighty deed is ascribed to Assur in the time of Sennacherib. Among the Hebrews it is Yahwe who violates Rahab, overcomes Tehom, punishes Leviathan, and creates the world. Later the struggle is transferred to Michael and the Dragon and St. George and the Dragon. In the astral system of the Babylonian sages, which identified the chief deities with the great stars, Marduk was thought of as connected with the planet Jupiter. The Marduk of Babylon therefore seems to have lost to some extent the solar character that Marduk of Eridu possessed. The spiritual nature ascribed to him as lord of gods and men comes to view in many hymns. In one of these the worshiper prays: "Put truth into my mouth, let good thoughts be in my heart." The great temple of Marduk in Babylon was known as E-sag-ila (the lofty house), and to him was also dedicated the temple tower, called E-temen-an-ki (the house of the foundation of heaven and earth). Both have been laid bare by the excavations of the Deutsche Orientgesellschaft. (See BABYLON; BABEL, TOWER OF.) Consult: Zimmern, in Schrader, *Die Keilinschriften und das alte Testament* (3d ed., Berlin, 1902); Jastrow, *Die Religion Babyloniens und Assyriens* (Giessen, 1902–12); Jeremias, *Das alte Testament im Lichte des alten Orients* (Leipzig, 1906); Rogers, *The Religion of Babylonia and Assyria* (London, 1908); Condamin, in Huby, *Christus: Manuel d'histoire des religions* (Paris, 1913).

MARE AU DIABLE, mär ō dyä'bl', LA (the devil's pool). A romance by George Sand (1846).

MARÉCHAL, mȧ-rā'shȧl', PIERRE SYLVAIN (1750–1803). A French atheistic writer, born in Paris. He studied law, but became sublibrarian at the Collège Mazarin and held that position until 1784. His parody on the Psalms (1784) caused his dismissal, and four years afterward his *Almanach des honnêtes gens*, a sort of calendar, in which the names of celebrated men were substituted for those of saints, earned him four months in prison. His other works include: *Les voyages de Pythagore* (1799) and a *Dictionnaire des athées anciens et modernes* (1800), in which he was assisted by Lalande, the astronomer.

MARE CLAUSUM, mā'rē klą'sŭm *or* mä'râ klou'sụm (Lat., closed sea). In international law, a body of water, as a bay, a sea, or a great lake, which is under the exclusive jurisdiction of a single power. Usually such a body of water is *mare clausum* when its shores are exclusively possessed by a single power, as is the case with Lake Michigan, which lies wholly within the territory of the United States, and as was formerly the case with the Black Sea before Russia had wrested its northern and eastern shores from Turkey. The doctrine that a nation may by appropriation convert a portion of the open sea into a *mare clausum* was formerly maintained by Great Britain with respect to the Narrow Seas, the North Sea, and the Atlantic from Norway to Spain, by Russia with respect to Bering Sea within 100 miles of the Alaskan and Siberian coasts, and by Sweden and Denmark with respect to the Baltic and Arctic seas, but these pretensions were always disputed and have long since been abandoned. See HIGH SEAS; BERING SEA CONTROVERSY.

MAREE, mȧ-rē', LOCH. A beautiful lake in Ross and Cromartyshire, northwestern Scotland (Map: Scotland, C 2). It is about 12 miles long by 2 miles wide, and very deep. It is studded with islets, and surrounded by mountains 3000 feet high. It drains by the Ewe over an artificial dam to Loch Ewe.

MAREI'A, or **MA'REO'TIS** (Lat., from Gk. Μαρεῶτις). A salt lake of the Nile delta in the north of Egypt, separated from the Mediterranean by a narrow isthmus of sand on which

is situated the city of Alexandria (Map: Egypt, E 1). Its modern name is Birket or Behêret Maryut. It is some 12 miles long, with width of about the same extent, but in antiquity it is said to have been somewhat larger. The surrounding district was anciently very fruitful and the Mareotic wine had a high reputation. During the Middle Ages the lake dried up because the canals flowing into it from the Nile were choked with sand. In 1801 the English, during the siege of Alexandria, cut through the isthmus west of Abukir, allowed the sea to flow in, and destroyed 150 villages. Mehemet Ali tried to reclaim the resulting salt marsh (6 to 10 feet deep), but with little success. The water of the lake is used for the manufacture of salt by evaporation. Consult Stanley Lane-Poole, *History of Egypt in the Middle Ages* (New York, 1905), and Baedeker, *Egypt* (6th ed., Leipzig, 1908).

MARE ISLAND. An island, about 2 miles long, in Solano Co., Cal., at the east end of the Bay of San Pablo and opposite the city of Vallejo, from which it is separated by a strait half a mile wide. It has ferry connection with that city. On its west shore is situated the Pacific station of the United States navy, its yard being one of the largest in the country. It has a naval arsenal, sectional floating dock, an observatory, and a lighthouse of the first order.

MARE LIBYCUM. See LIBYAN SEA.

MAREMMA, mȧ-rĕm′mȧ (corruption of *Marittima,* "situated on the sea"). A vast marshy region of Tuscany, west Italy, extending along the coast, from the mouth of the Cecina to Orbetello and 15 to 20 miles inland (Map: Italy, C 3). In ancient times these districts were drained, cultivated, and inhabited, but the neglect of watercourses has brought about their malarial condition, which is, however, being again improved, since Leopold of Tuscany in the early part of the nineteenth century began drainage canals. The railway line along the coast has greatly contributed to the improvement of the district.

MARENCO, mȧ-rĕn′kō, CARLO, COUNT (1800–46). An Italian Romantic dramatist, born at Cassolnuovo, resident and mayor of Ceva, Piedmont. He was the author of some 15 tragedies, dealing with mediæval subjects and revealing the influence of Alfieri, and more directly that of Pellico, as well as a tendency to adopt the methods of the historical drama of Romanticism. The most popular of his plays were *Buondelmonte, Pia de' Tolomei,* and *Arnaldo da Brescia.* Of these the *Pia* still enjoys some vogue, after being immensely popular in its own day, interpreted by Adelaide Ristori. The *Arnaldo* was overshadowed by Nicolini's famous tragedy of the same title. Consult the edition of his *Tragedie* (Turin, 1837–44); the *Tragedie inedite, etc.* (Florence, 1856); Orlandi, *Il teatro di C. M.* (Florence, 1900).

MARENCO, LEOPOLDO, COUNT (1831–99). An Italian dramatist, born at Ceva, Piedmont. He was the son of Carlo Marenco (q.v.) and wrote his play *Isabella Orsini* when only 20 years old. In 1871 he scored decided triumphs with *Il falconiere di Pietro Ardena* and *Celeste.* His plays, which affect, when most distinctive, a sentimental tone and a mediæval stage setting, include: *Piccarda Donati* (1869); *Saffo* (1880); *Rosalinda* (1884); *Lo spiritismo* (1869); *Il ghiacciaio di Monte Bianco* (1870); *Quel che nostro non è* (1877); *Giorgio Gandi* (1882); *Bice* (1884). His collected works were published in 20 volumes (1884 et seq.) at Turin.

MARENGO, mȧ-rĕn′gō. A locality near Alessandria, Italy, the scene of one of the most famous of Napoleon's battles, fought on June 14, 1800, in which the French completely defeated the Austrians under General Melas (Map: Italy, B 2). After Napoleon got control of the government he determined to wage a vigorous war against Austria so that she would be unable to help England and Russia. Moreau (q.v.) was sent to Germany, while Napoleon himself crossed the Great St. Bernard Pass into Italy with about 40,000 men. On June 14 Melas crossed the Bormida from Alessandria, assailed the French, and at first was successful, because Napoleon had scattered his troops in an effort to find the Austrians. But at five in the afternoon Desaix (q.v.) and Kellermann (q.v.) appeared with fresh troops and swept all before them, though the former lost his life in the charge. The French lost about 7000 in killed, wounded, and prisoners, while the Austrians lost about 10,000. The battle firmly established Napoleon's supremacy in France. General Melas was compelled to sign the Convention of Alessandria, by which he surrendered Genoa, Piedmont, and the Milanese, and promised to withdraw the Austrian garrisons from all cities to the west of the Mincio. Military critics have generally maintained that the Marengo campaign was one of the most brilliant conceptions in the history of warfare. See NAPOLEON I.

MARENHOLTZ-BÜLOW, mä′ren-hōlts-bu′lō, BERTHA VON (1810–93). A German educator and author, born near Brunswick. Attracted by the ideas of Friedrich Fröbel (q.v.), whom she met in 1850, she became his disciple and devoted her life to founding kindergartens in Germany and many other European countries. Her activity in London attracted much attention and is noticed by Dickens in *Household Words.* Among her writings are: *Beiträge zum Verständnis Friedrich Fröbels* (1876); *Der Kindergarten* (2d ed., Dresden, 1878); and a number of pamphlets on the kindergarten, several of which have been translated into English. Consult Goldschmidt, "Bertha von Marenholtz-Bülow," No. 239, in the *Sammlung wissenschaftlicher Vorträge* (Hamburg, 1896), and *Life of Baroness Bertha Marenholtz-Bülow,* by her niece of the same name (New York, 1901).

MARENZIO, mȧ-rĕn′tsī-ō, LUCA (c.1555–99). An Italian composer of madrigals, born at Coccaglio, between Bergamo and Brescia. He was a chorister in the Brescia Cathedral and received musical instruction from its organist, Giovanni Contini. He began publication in Venice (1581), with a collection of madrigals for five voices, and he issued nine books of the same within 10 years. About 1584 he was living in Rome, employed by Cardinal d'Este as maestro di cappella, and in 1587 he had a post at the Polish court, but went back to Rome (1595), and received an appointment in the chapel of the Pope. He composed a quantity of Church music, but it is on account of the great advance he made upon his predecessors in the production of madrigals that he is chiefly remembered. Six books of them for six voices were published in Venice (1582–1609), and he wrote others for three, four, eight, and twelve voices.

MAREOTIS, mȧr′ē-ō′tĭs. See MAREIA.

MARET, mȧ′rĕ′, Hugues Bernard, Duke of Bassano (1763–1839). A French statesman. At the beginning of the Revolution he was editor of the *Bulletin* (the original of the *Moniteur*), containing the proceedings of the Constituent Assembly, a position which gave him much political influence. At first inclining to the Jacobins, he subsequently favored a constitutional monarchy. In 1792 he became chief of a bureau in the Ministry of Foreign Affairs, and after Aug. 10, 1792, was employed in various diplomatic missions—as Envoy to England, to Naples (1793), and to England again (1797). He coöperated with Napoleon in the coup of the 18th Brumaire (1799). He became Napoleon's confidential adviser, and later his Secretary of State for Foreign Affairs. During the Hundred Days, Napoleon made him Duke of Bassano. He was in exile during the Restoration; but Louis Philippe restored him to the peerage in 1831, and made him the head of a short-lived ministry.

MARETZEK, mä′re-tsĕk, Max (1821–97). A German-American composer, director, and impresario, born in Brünn, Moravia. He studied music there and also at Vienna and Paris. In 1843 he composed the opera *Hamlet*, which secured him the place of music director at the Royal Opera in London. In 1847 he went to New York, and in 1848 was the musical director at the Astor Place Opera House. In 1849 he commenced his career as an impresario of Italian opera in New York, and continued it until 1878, subsequently teaching. He published in 1855 *Crochets and Quavers: or, Revelations of an Opera Manager in America;* composed the opera *Sleepy Hollow* (1879); and wrote chamber and orchestral music. He died on Staten Island, N. Y.

MAREY, mȧ′rā′, Etienne Jules (1830–1904). A French physiologist, born at Beaune (Côte-d'Or). He went to Paris when 20 years old, took the degree of doctor of medicine in 1860, and the same year began work in physiology at the Collège de France. In 1864 he established a physiological laboratory, and in 1867 was appointed adjunct professor of physiology in the Collège. He became a lauréat of the Institute and a member of the Academy of Medicine (1872) and of the Institute (1878). He began to publish scientific tracts as early as 1857, and worked on the experimental physiology of the heart and circulation, on animal heat, on the electric phenomena which provoke or accompany movements in animals, and on the action of poisons which especially concern the nerves and muscles. In 1863 he invented the sphygmograph, which has been an important laboratory instrument. His studies and works on motion in animals, especially on the flight of birds and insects, have given him a wide reputation, since he devised photographic methods of recording the motions of the wings. His most important publications were: *Physiologie medicale de la circulation du sang* (1860–64); *Physiologie du système circulaire* (1866); *La methode graphique dans les sciences experimentales* (1878); *Developpement de la methode graphique par l'emploi de la photographie* (1885); *Physiologie du mouvement: le vol des oiseaux* (1890); *Le mouvement* (1894).

MARGADANT, mär-gȧ-dänt′, Simon Lemm. The real name of the German humanist Simon Lemnius (q.v.).

MAR′GARET (1353–1412). Queen of Denmark, Norway, and Sweden. She was the second daughter of Valdemar IV, King of Denmark, and the wife of Haakon VI, King of Norway, whom she married in 1363. On the death of her father without direct male heirs, the Danish nobles, after an interregnum, offered the crown in 1376 to Margaret and her husband in trust for their infant son Olaf. By the death of Haakon in 1380 Margaret became sole guardian of the young Prince, who died in 1387. Such was the skill with which she had conducted the government that the estates of both kingdoms concurred in electing her as their joint sovereign. She nominated her cousin, Eric of Pomerania, her successor; and although, owing to Eric's infancy at the time, and his subsequent incapacity, the real power rested in the hands of Margaret, she contented herself from that time with the title of "Margaret, by the grace of God, daughter of Valdemar, King of Denmark." At the moment that Margaret was cementing the union of Norway and Denmark, the condition of affairs in Sweden opened the way for a further extension of her power. The Swedish King, Albert of Mecklenburg, had so thoroughly alienated the affections of his subjects that the nobles declared the throne vacant and offered to acknowledge Margaret as their ruler. The Queen lost no time in sending an army into Sweden to support her pretensions, and defeated the King's German troops at Aasle near Falköping in 1389, where Albert fell into her hands. The King remained in prison till 1395, during which time Margaret continued the work of subjugating Sweden. In 1397 she effected the so-called Union of Kalmar (q.v.), by which the crowns of the three Scandinavian kingdoms were henceforth to remain united. Eric, who was in his sixteenth year, was invested with the triple dignity. Margaret continued to exert great influence in the government. She died towards the close of 1412, while she was attempting to bring about peace between Eric and the Duke of Holstein. Consult M. Hill, *Margaret of Denmark* (London, 1898).

MARGARET, or **MARGUERITE**, mär′g'rēt′ (variously called of Angoulême, of Orléans, of Alençon, and of Navarre) (1492–1549). A daughter of Charles of Orléans, Count of Angoulême, sister of King Francis I of France. She was born at Angoulême, April 11, 1492. In 1509 she married the Duke d'Alençon, and two years after his death (1527) Henri d'Albret, titular King of Navarre. His small dominions, for Francis I failed to reconquer the entire Kingdom as he had promised, she governed after his death in 1544. Their daughter, Jeanne d'Albret, became mother of Henry of Navarre (Henry IV of France). Margaret was active in politics, in religious reform, and in literature. Of a strong mystical tendency, she favored religious liberty rather than Protestantism, and was the leading exponent of the Neoplatonic movement which was cultivated for a while within a restricted milieu. During the ascendancy of her influence with her brother, she was an effectual defender and patron of humanists and men of letters of such varied complexion as Rabelais, Marot, Des Périers, Dolet, Peletier, Brodeau, and many others. Her little courts at Nérac and at Pau, for a time the most brilliant intellectually in Europe, roused seemingly groundless slander. After undergoing many disappointments she died at Odos in Bigorre, the 21st of September, 1549. Her affection for her

brother was especially beautiful. During his captivity in Spain in 1525, she went to console him and tried in vain to secure less rigorous conditions of release from Charles V. Though a victim of much slander on the part of her enemies, no charges have been brought against her personal character that can be supported by investigation. Her literary work comprises *Le Miroir de l'âme pécheresse* (Alençon, 1531), which was translated into English prose in 1544 by Queen Elizabeth, then eleven years of age. This translation was reproduced in facsimile by Ames (London, 1897). In 1547 some of the religious and dramatic poems of Margaret of Navarre were collected together in a volume entitled *Les Marguerites de la Marguerite des Princesses*, reprinted in 1873 in four volumes. While her poems are usually written in an easy, flowing style, there hovers over them a veil of mysticism which at times obscures the thought. Her *Letters*, of considerable interest from the historical or literary point of view, were published by Génin in 1841–42 (2 vols., Paris). Other poems, consisting of two *comédies*, *Les prisons*, *Le navire*, and a number of shorter pieces, were discovered in the National Library in 1895 and published by Lefranc under the title *Dernières poésies* (Paris, 1896). As a prose writer Margaret is probably deserving of even greater praise than as a poet. Though some have attempted to cast doubt upon the authorship of the *Heptameron* (q.v.), it is very probable that Margaret dictated the work to her secretary Des Périers, or at least the greater part of it. It was originally printed in 1559 at the order of Jeanne d'Albret. Though apparently of no great personal beauty, Margaret's character was marked by a sweetness of disposition combined with intellectual strength as well as a scrupulous morality free from all prudery; and she probably contributed more to the renaissance of learning in France than any other individual at that time, not even excepting Francis himself.

Bibliography. Margaret has been the subject of a considerable number of studies in recent years, due to a certain extent to the large number of her inedited works that are being published. She forms the subject of one of Brantôme's discourses in *Les dames illustres* (vi, 1665–66). Other works worthy of note are Leroux de Lincy, *Essai sur la vie et les ouvrages de Marguerite d'Angoulême* (Paris, 1853); Ferdinand Lotheissen, *Königin Margarete von Navarra* (Berlin, 1885); M. W. Freer, *The Life of Marguerite d'Angoulême* (London, 1895); Rasmussen, *Marguerite of Navarre* (Copenhagen, 1901); Courteault, *Marguerite de Navarre* (Paris, 1904); M. G. Fawcett, *Five Famous French Women* (London, 1905); M. B. Ryley, *Queens of the Renaissance* (Boston, 1907); Cristina Garosci, *Margherita di Navarra* (Turin, 1908); and Madame Darmesteter, *Marguerite d'Angoulême, reine de Navarre* (Paris, 1910). For a critical estimate of her, see Cabantous, *Marguerite d'Alençon et les débuts de la réforme* (Montauban, 1898), and A. J. M. Lefranc, *Grands ecrivains de la renaissance* (Paris, 1914). For the most recent discovery of inedited poems by her, see F. Gohin, "Huitains inédits de Marguerite de Navarre et d'un amant platonique," in the *Mélanges Emile Picot*, vol. i (Paris, 1913).

MARGARET, Saint (c.1045–93). A queen of Scotland. She was the daughter of Edward the Exile, son of Edmund Ironside, and was born, according to tradition, in Hungary. In 1057 she came to Scotland with her brother Edgar Atheling (q.v.) and soon after became the wife of King Malcolm III. She appears in the chronicles as a woman of almost angelic character and saintly virtues, and numerous instances are recorded of her works of piety and unceasing devotion to the cause of the Church. She exercised a refining influence on the rough manners of the Scottish court by the example of her stainless life, and advanced the welfare of her people by her wide beneficence to the crippled, the orphaned, and the poor. She died Nov. 17, 1093, after receiving news of the death of her husband and her eldest son in a border raid. She was canonized by Pope Innocent IV. Consult: W. F. Skene, *Celtic Scotland*, vol. i (Edinburgh, 1876); Andrew Lang, *History of Scotland from the Roman Occupation*, vol. i (2d ed., New York, 1900); R. S. Rait, *Five Stuart Princesses* (ib., 1908).

MARGARET GRUNT. See Margate Fish.

MARGARET OF ANJOU, äN'zhōō' (1430–82). Queen Consort of Henry VI of England. She was born on March 23, 1430, and was the daughter of René the Good of Anjou, titular King of Naples and Jerusalem. When in 1439 the peace party in England, headed by Cardinal Beaufort, came into power, they sought to end the Hundred Years' War, and as a step in this direction looked around for a suitable French princess as a wife for the young Henry VI. Their choice fell upon Margaret, and in 1445 the marriage took place. She became, however, rapidly unpopular, the loss of the English possessions in France being charged against her. When in 1453 a son was born to her, Richard, Duke of York, gave up all hope of succeeding peacefully to the crown. Just before the birth of the son Henry had become insane and York had been made Regent; but on the King's recovery in 1455 he led the Yorkists in arms against the house of Lancaster, inaugurating the Wars of the Roses. Margaret became leader of the Lancastrians. In 1460 she was victorious at Wakefield, where the Duke of York fell, but the battle of Towton (q.v.) in 1461 was disastrous to the Lancastrian cause. In 1462 and 1463 Margaret made attempts to restore the fortunes of her house and invaded England without success; and in 1464 her adherents were defeated at Hexham. In 1470 Warwick (q.v.) joined the Lancastrians and restored Henry VI to the throne, but in 1471 Edward IV won a decisive victory at Barnet; Henry was recaptured, and spent the remaining weeks of his life in the Tower. Meanwhile Margaret had landed in England, but was defeated and taken at Tewkesbury in 1471, while her son lost his life on the battlefield. She remained in captivity for about five years, till Louis XI redeemed her for 50,000 crowns. She then retired to France, and died at the château of Dampierre, near Saumier in Anjou, on Aug. 25, 1482.

Bibliography. M. A. Hookham, *Life and Times of Margaret of Anjou, Queen of England and France* (2 vols., London, 1872); Sir J. H. Ramsay, *Lancaster and York*, vol. ii (Oxford, 1892); C. W. C. Oman, *Political History of England*, vol. iv (London, 1906); Schmidt, *Margareta von Anjou* (*Palaesta*, vol. liv, Berlin, 1906); Gairdner's introduction to the *Paston Letters*, vol. i (Edinburgh, 1910); Edgcumbe Staley, *King René d'Anjou and his Seven Queens* (New

York, 1912). See ROSES, WARS OF THE; HENRY VI.

MARGARET OF AUSTRIA (1480–1530). A daughter of Maximilian I of Austria and of Mary of Burgundy. She was born at Brussels and brought up at the French court. Affianced to the Dauphin, afterward Charles VIII, by the Treaty of Arras (1482), she was sent back in 1491 by the King, who married Anne of Brittany. About five years later she married John, Prince of Asturias, heir to the Spanish throne, but he died the next year. In 1501 she became the wife of Philibert II, Duke of Saxony, who died three years later. In 1507 her father made her Regent of the Netherlands. In this office she displayed great ability, carried on the policy of centralization, repressed heresy, but watched also over the material welfare of the country. She participated in the conference at Cambrai in 1508, and negotiated with Louise of Savoy the Peace of Cambrai (1529), called the *Paix des Dames* (Ladies' Peace). Consult Christopher Hare, *High and Puissant Princess Marguerite of Austria* (New York, 1907), and E. E. Tremayne, *The First Governess of the Netherlands: Margaret of Austria* (London, 1908).

MARGARET OF FLANDERS, or OF CONSTANTINOPLE (c.1200–80). Countess of Flanders and Hainault. She was the younger daughter of Baldwin IX, Count of Flanders and Hainault, who died without male issue, the succession passing to her elder sister, Joanna. Margaret, who was usually called "Black Meg," married Bouchard d'Avesnes, bailiff of Hainault, in opposition to the King's wishes, and after a number of years the marriage was annulled, owing to the fact that Bouchard in early life had taken the lower orders of priesthood. In 1223 Margaret married William of Dampierre, and between the children of the two marriages bitter strife ensued for the succession to the lordship over the two counties, which Margaret had obtained in 1244, on the death of her sister. The dispute was referred to the arbitrament of Louis IX of France, who decided that after the death of Margaret Hainault should go to the sons of d'Avesnes, while the children of the second marriage were to receive Flanders. Margaret's reign of 35 years seems to have been one of prosperity for her subjects. Consult Charles Duvivier, *La Querelle des d'Avesnes et des Dampierre* (2 vols., Brussels, 1894).

MARGARET OF PAR'MA (1522–86). Regent of the Netherlands. She was an illegitimate daughter of the Emperor Charles V and was born and brought up in Brussels. In 1536 she married Alessandro de' Medici, Duke of Florence, who was murdered in 1537; and in 1542 Ottavio Farnese, who became Duke of Parma and Piacenza. She was appointed by Philip II in 1559 to govern the Netherlands with Granvelle (q.v.) as her chief adviser. Though well inclined personally to the people of the Netherlands and their liberties, she yielded readily to the fanatic orders of Philip and the counsels of Granvelle. The attempt to introduce the Inquisition into the country brought about the revolt of 1566, which was the beginning of the long struggle for independence in the Netherlands. In 1567 Alva (q.v.) was sent to crush out all opposition and Margaret resigned her office.

MARGARET OF VALOIS, vä'lwä', or OF FRANCE (1553–1615). A French princess, daughter of Henry II of France and Catharine de' Medici, and wife of Henry IV. She was born at Saint-Germain-en-Laye, May 14, 1553, and received an excellent education. Her marriage to Henry of Navarre at Paris on Aug. 18, 1572, was intended to be a bond of perpetual reconciliation between Catholics and Huguenots, but was followed after a week by the Massacre of St. Bartholomew. With no love lost on either side, husband and wife, during Henry's forced sojourn at the French court, lived in good-natured toleration of each other's transgressions. After the flight of Henry of Navarre in February, 1576, she was detained for some time as a hostage, but in 1578 rejoined her husband at Pau in Gascony. There she remained for four years and then returned to Paris. Her intrigues at court aroused the resentment of Henry III, who subjected her to repeated humiliations, imprisoned her, and finally instituted a public investigation into her conduct (1583). From 1587 to 1605 she lived at the château of Usson in Auvergne, and there wrote her *Mémoires*. In 1599, after the death of Gabrielle d'Estrées, the favorite of Henry IV, she consented to a divorce from the King, who for a number of years had been desirous of an heir. In 1606 she returned to Paris, where she lived on the best of terms with Henry, attending the coronation of her successor, Maria de' Medici, in 1610. Her *hôtel* in the Rue de Seine was a centre for Paris learning and fashion until her death. With her the house of Valois became extinct. Her *Mémoires*, *Poésies*, and *Letters* were published by Guessard (Paris, 1842). Consult: Leo de Saint-Poncy, *Histoire de Marguerite de Valois* (Paris, 1887); C. Merki, *La reine Margot* (ib., 1905); Albert Savine, *La vraie Reine Margot d'après les documents d'archives et les mémoires* (ib., 1908); H. N. Williams, *Queen Margot, Wife of Henry of Navarre* (London, 1911).

MAR'GARET TU'DOR (1489–1541). The wife of the Scottish King James IV (q.v.). She was born at Westminster, Nov. 29, 1489, the daughter of Henry VII by Elizabeth of York. She was married after considerable negotiation to King James IV of Scotland on Aug. 8, 1503. She played a considerable rôle in the shifting politics of her time, especially after the death of her husband in 1513, but her importance to posterity consists chiefly in the fact that from her James VI of Scotland derived his claims to the English throne, which he ascended as James I of England in 1603.

MARGAR'IC ACID (from Lat. *margarita*, from Gk. *μαργαρίτης*, *margaritēs*, pearl, from *μάργαρος*, *margaros*, pearl oyster; so called from being deposited as pearly scales during cooling in alcohol in which it has been dissolved), $C_{16}H_{33}COOH$. An artificial solid fatty acid, similar to stearic acid and melting at about 60° C. It has been found in the wax of lichens. An acid having the same molecular composition as margaric acid, but melting at a somewhat lower temperature (55° C.), has been found in the seeds of *Datura stramonium* Linné, and is therefore named *daturic acid*. The name margaric acid was formerly applied to a mixture of palmitic and stearic acids that occurs in certain natural products. The fact that this substance was a mixture, and not a definite chemical compound, was demonstrated by Heintz.

MARGARITA, mär'gȧ-rē'tȧ. An island in the Caribbean Sea near the coast of Venezuela, to which country it belongs. Together with other neighboring islands, it forms the State of

Nueva Esparta (Map: Colombia, E 1). It is about 45 miles long and from 5 to 20 miles broad, with an area of 444 square miles. It consists of two mountain ranges, one of them over 4000 feet high, united by a low isthmus. There is a little agriculture and cattle raising, but the principal industries are fisheries and the production of salt. The valuable pearl fisheries of the island are a government monopoly, leased for a term of years to a private company, which is restricted so as to prevent the extinction of the pearl-producing oysters. The population is estimated at 50,000, mostly civilized Indians. The island was discovered by Columbus in 1498. The capital is Asunción (pop., 1933) and the chief port is Pampatar.

MAR'GARITE (OF. *marguerite*, Fr. *margarite, marguerite*, pearl, from Lat. *margarita*, pearl), or PEARL MICA. A hydrated calcium-aluminium silicate, closely related to the mica group and crystallizing in the monoclinic system. It is of a light-gray, red, or yellow color and is found associated with corundum, especially in the emery deposits in Asia Minor and the islands of the Grecian archipelago; also in Chester, Mass., Unionville, Pa., and localities in North Carolina.

MARGARITONE D'AREZZO, mär'gȧ-rē-tō'nȧ dȧ-rĕ'tsô (c.1236–89). A prominent Tuscan painter of the late mediæval epoch, a native of Arezzo. His frescoes in San Clemente at Arezzo have perished, but his Madonna and his Crucifix at San Francesco, his altarpiece at the National Gallery, and his various portraits of St. Francis show crude color, childish drawing, and lack of life; he was a representative of the end of the Italo-Byzantine decline rather than a herald of the Giottesque revival. Portraits of St. Francis were his favorite theme; several remain, both signed and unsigned, in the Vatican, at Siena, Florence, Pisa, Castiglione, and elsewhere. Vasari's contention that he excelled as a sculptor and architect is open to doubt, as the works he attributes to him—the church of San Ciriaco at Ancona and the monument of Gregory X at Arezzo—are not of his age or manner.

MAR'GATE. A popular watering place and municipal borough in the Isle of Thanet, Kent, England, 74 miles east of London and contiguous to Westgate and Broadstairs (Map: England, H 5). It has important fisheries, but is more noted as a pleasure resort for Londoners, with a theatre, baths, libraries, zoölogical gardens, esplanade, and excellent hotels. It has many London seaside charitable institutions. The town owns its water supply. Its ancient name was Meregate—the gate to the sea. Its parish church of St. John the Baptist was founded in 1050. Pop., 1901, 23,000; 1911, 27,085.

MARGATE FISH, or MARGARET GRUNT. A food fish (*Hæmulon album*), one of the grunts or roncos of the Gulf of Mexico and southward, where it is common in water of moderate depth and reaches a length of 2 feet or more. It is white, with olive-colored back and fins and indistinct spots; the mouth is orange. In some places no one will eat it, but at Pensacola and Key West, and in Nassau and other parts of the British West Indies, it is commonly sold in the markets, frequently under the name "porgy."

MARGAY, mär'gȧ (Brazilian name). A wild cat (*Felis tigrina*) of the forested parts of tropical America. The animal is so variable in size, color, and markings that several species have been described from its varieties. It seems to differ little from cats generally in its habits, and occasionally is domesticated.

MARGELAN, mär'ge-län', or MARGILAN, OLD and NEW. Two towns in the Territory of Ferghana, Russian Turkestan (Map: Asia, Central, O 2). Old Margelan, about 40 miles east of Khokand, is an Asiatic city, surrounded by a wall and containing mosques and bazars, etc. It has some trade in locally woven camel's-hair cloth and is the centre of a rich agricultural district. Pop., in 1912, 43,586, mostly Sarts, Tajiks, and Jews. New Margelan, situated about 10 miles south of the old town, is the seat of the administration of the territory, and had in 1912 a population of 10,751, mostly Russians.

MARGGRAF, mär'gräf, ANDREAS SIGISMUND (1709–82). A German chemist. He was born in Berlin; studied at Berlin, Strassburg, Halle, and Freiberg; and in 1735 became an assistant to his father, a chief apothecary. Elected a member of the Berlin Academy of Sciences in 1738, he was placed in charge of its chemical laboratory after 1754 and of its physics class after 1760. He made valuable observations on phosphoric acid and made improvements in metallurgical processes. His most important contribution, however, was in connection with the discovery of sugar in beet roots, and in 1747 he published an account of his experiments in extracting this sugar. He published also *Chymische Untersuchungen eines sehr merkwürdigen Salzes, welches das Saure des Phosphors in sich enthält* (1757) and *Chymische Schriften* (2 vols., 1761–67).

MARGGRAFF, HERMANN (1809–64). A German poet and humorous author. He was born at Züllichau; studied at Berlin; and, devoting himself to journalism, lived and wrote in Leipzig, Munich, Augsburg, and Frankfort, finally settling in Leipzig (1853) as editor of the *Blätter für literarische Unterhaltung*. He wrote the critical essay, *Deutschlands jüngste Kultur- und Litteraturepoche* (1839); several plays, as, e.g., *Das Täubchen von Amsterdam*; humorous novels, including *Justus und Chrysostomus, Gebrüder Pech* (1840), *Johannes Mackel* (1841), and *Fritz Beutel* (1855), after the fashion of Münchhausen; a biography of Ernst Schulze (Leipzig, 1855); *Schillers und Körners Freundschaftsbund* (1859); *Gedichte* (1857); *Balladenchronik* (1862).

MARGHERITA, mär'gȧ-rē'tȧ (MARIA MARGHERITA TERESA GIOVANNA DE SAVOIA) (1851–). Queen Dowager of Italy, the daughter of Ferdinand, Duke of Genoa. She was married in 1868 to her cousin, Humbert, the Prince Royal, who succeeded his father, Victor Emmanuel I, as King of Italy, Jan. 9, 1878, and who was assassinated at Monza on July 29, 1900. Her charm of manner and sweetness of disposition made her extremely popular in Italy.

MARGIN DEALS (OF. *margine*, from Lat. *margo*, boundary). Transactions in which one person, in the character of purchaser, puts up collateral security for the performance of his agreement to purchase securities or other property of fluctuating value. For example, a person employs a broker to purchase stock or other property for him. The buyer not having the money with which to pay the price, the broker advances it, upon receiving from the buyer (his principal) the deposit of a specified sum (margin) and an agreement that he (the broker) may sell the stock in case it depreciates so

that the stock and margin are no longer ample security for his advance. Such a transaction is perfectly valid and enforceable at common law. By constitutional or statutory provisions in some of the United States, however, even margin deals of this sort have been put under the ban and are void as tending to encourage speculative dealing in shares of corporations or in the necessaries of life, and thus to enhance their price to the nonspeculative buyer. In such jurisdictions the buyer may repudiate the agreement and recover from the broker any moneys put into his hands as a margin.

The term is more frequently applied to contracts entered into, and deposits made, to disguise gambling transactions in stocks or in property sold for future delivery. Deals of this sort are illegal and void at common law. Not only is the contract itself unenforceable, but negotiable paper or other securities given as a part of the transactions are void, and property deposited as a margin may be recovered. Margin deals of this kind, being in reality gambling transactions, are punishable in some of the States as criminal offenses. Consult F. R. Mechem, *The Law of Agency* (Chicago, 1889), and J. R. Dos Passos, *Treatise on the Law of Stock Brokers and Stock Exchanges* (2d ed., 2 vols., New York, 1905).

MARGITES, mär-jī'tēz. A mock-heroic epic, ascribed to Homer by Aristotle and by him considered to be the germ of comedy. It has also been attributed to Pogres of Halicarnassus, the brother of Queen Artemisia. It describes the various predicaments in which Margites, a foolish young fellow, was placed.

MARGOLIOUTH, mär-gō'li-ōōt, DAVID SAMUEL (1858–). An English Arabic scholar, born in London. He studied at Winchester and at New College, Oxford, became fellow of New College (1881), and in 1889 was appointed Laudian professor of Arabic at Oxford. He also held the post of assistant keeper of Oriental books and manuscripts in the British Museum. In 1912 he represented the British government at the Oriental Congress at Athens. He wrote: *Analecta Orientalia ad Poeticam Aristoteleam* (1888); *Jepheth Ben Eli, Commentary on the Book of Daniel* (1889); *Arabic Papyri of the Bodleian Library* (1893); *Chrestomathia Baidawiana* (1894); *Letters of Abul 'Ala* (1898); *Lines of Defense of the Biblical Revelation* (1900; 3d ed., 1903); *Mohammed and the Rise of Islam* (1905); *Cairo, Jerusalem and Damascus* (1907); *Mohammedanism* (1911); *The Early Development of Mohammedanism*, Hibbert lectures (1914); and he edited Yakut's *Dictionary of Learned Men* (1907–13) and Aristotle's *Poetics* (1911).

MARGO'LIS, MAX LEOPOLD (1866–). An American Hebrew philologist, born at Merech, Vilna, Russia, and educated at the Leibnitz Gymnasium, Berlin, and at Columbia University, New York (A.M., 1890; Ph.D., 1891). He was lecturer on Jewish literature at the Glenmore School for Cultural Sciences at Keene, N. Y., in 1892, assistant professor of Hebrew and biblical exegesis in 1892–97 and professor of biblical exegesis in 1905–07 at the Hebrew Union College, Cincinnati, Ohio, and assistant professor of Semitic languages and literatures (1897–98) and associate professor (1898–1905) at the University of California. After visiting Europe in 1907–08, he served for a year as editor in chief of Bible translation for the Jewish Publication Society of America, and in 1909 he became professor of biblical philology at Dropsie College for Hebrew and Cognate Learning, Philadelphia. He published: *The Columbia College Manuscript of Meghilla* (1892); *An Elementary Text-Book of Hebrew Accidence* (1893); *The Theological Aspect of Reformed Judaism* (1904); *A Manual of the Aramaic Language of the Babylonian Talmud* (1910).

MAR'GRAVE (Ger. *Markgraf*, border count). In early mediæval times the military chieftains or guardians to whom was intrusted the defense of the border, with the government over such frontier provinces, known as marks or marches. In continental Europe these margraves at first held their offices only during life, but, as they became more independent and powerful, their positions and titles became vested in the same line, and they were established as a powerful hereditary order of nobility. In England the lords or wardens of the marches were appointed to guard the frontiers of Wales and Scotland, and the office was long regarded as special or temporary; the term "marquis" was not applied to the office until 1395. See GRAF; MARK; MARQUIS.

MARGRY, mär'grē', PIERRE (1818–94). A French historian, born at Paris. He became as a young man adjunct curator of the archives of the department of the Minister of Marine, and in 1842 was intrusted with the task of studying the colonial history of France in America. Among his works are: *La navigation du Mississippi et les précurseurs de Fulton aux Etats-Unis* (1859); *Les Normands dans les vallées de l'Ohio et du Mississippi* (1860); *Les navigateurs français et la révolution maritime du XIVème au XVIème siècle* (1867); *Relations et mémoires pour servir à l'histoire de la France dans les pays d'outre mer* (1867); *Les seigneurs de la Martinique* (1879); *Découvertes et établissements des Français dans l'Amérique septentrionale* (1879–88); *Le conquérant des îles Canaries* (1880). He edited *Les souvenirs d'un homme de lettres*, based on Augustin Jal's manuscripts (1877).

MARGUERITE, mär'ge-rēt'. A garden plant. See CHRYSANTHEMUM.

MARGUERITE, or **MARGARET.** The principal female character in Goethe's *Faust*.

MARGUERITE DE VALOIS. See MARGARET OF VALOIS.

MARGUERITTE, mär'g'-rēt', PAUL (1860–) and VICTOR (1866–). French novelists, brothers, sons of a general who fell at Sedan. Both were born in Algeria. Paul made his début as a naturalist writer, but turned more and more towards introspection and problems of morality. Alone he wrote: *Tous quatre* (1885); *La confession posthume* (1886); *Maison ouverte* (1887); *Pascal Gefosse* (1887; 2d ed., 1912); *Jours d'épreuve* (1889); *Amants* (1890; 2d ed., 1908); *Ma grande* (1892; 2d ed., 1911); *La tourmente* (1894); *L'Essor* (1896; 2d ed., 1910); *A la mer* (1906); *La flamme* (1909); *La faiblesse humaine* (1910); *La maison brûle* (1913). Victor, who had been an officer of cavalry, had published some verse and the novels *Le carnaval de Nice* (1897) and *Poum* (1897) before he joined his brother in one of the most notable collaborations in literary history. Alone he wrote in later years: *Prostituée* (1907); *Jeunes filles* (1909); *L'Or* (1910); *Pour mieux vivre* (1910); *L'Imprévu* (1910), a comedy;

Les frontières du cœur (1912); *Le journal d'un mollot* (1912); *La rose des ruines* (1913). Together the brothers produced a series of romances dealing with the Franco-German War, including *Le désastre* (1898), *Les tronçons du glaive* (1900), *Les braves gens* (1901), and *La commune* (1904). Their views on the social position of women are embodied in *Femmes nouvelles* (1899), *Les deux vies* (1902), and *Le prisme* (1905), the second of which was dramatized with great success as *Le cœur et la loi* (1905). They published a popular history of the war with Germany (1903); a volume of miscellaneous essays, *Quelques idées* (1905); *Sur le vif* (1906); *Vanité* (1907); *L'Autre*, a drama (1908); *Alphonse Daudet* (1908); *L'Eau souterraine* (1908; 2d ed., 1910); *Nos tréteaux* (1911). Paul Margueritte was one of the original members of the Académie Goncourt. Consult Pilon, *Paul et Victor Margueritte* (Paris, 1905).

MARHEINEKE, mär-hī'ne-ke, PHILIPP KONRAD (1780–1846). A German theologian. He was born at Hildesheim, May 1, 1780; educated at Göttingen; became repetent there, 1804; professor extraordinary of theology at Heidelberg, 1805; professor ordinary there, 1809; and in 1811 was called to the same position at Berlin and chosen pastor of the church of the Trinity, where he became a colleague of Schleiermacher. His studies lay principally in the direction of Christian symbolism and dogmatics. To the former he devoted his *Christliche Symbolik* (1810–14) and his *Institutiones Symbolicæ* (1812); to the latter, his *Grundlehren der christlichen Dogmatik* (1st ed., 1819; 2d ed., 1827). The second edition of this work is strongly Hegelian, and all his later work was done under Hegelian influence. The positive form of his theology may be found in his *Entwurf der praktischen Theologie* (1837). He wrote many books besides those named, including the important *Geschichte der deutschen Reformation* (1816) and *Die Reformation, ihre Entstehung und Verbreitung in Deutschland, dem deutschen Volke erzählt* (1846). He died in Berlin, May 31, 1846. His *Theologische Vorlesungen* appeared posthumously (1847–49), with biographical sketch. Consult Weber, *Le système dogmatique de Marheineke* (Strassburg, 1857), and Otto Pfleiderer, *Development of Theology in Germany* (3d ed., New York, 1909).

MARÍA CHRISTINA, mȧ-rē'ȧ krĭs-tē'nȧ (1806–78). Queen of Spain. She was a daughter of Francis I, King of the Two Sicilies, and was born in Naples, April 27, 1806. In 1829 she became the fourth wife of Ferdinand VII of Spain. In 1830 Ferdinand restored the law by which, in default of male issue, the right of inheritance was given to females. In October of that year the Queen gave birth to a daughter, Isabella. The Spanish Liberals gladly embraced the cause of the Queen, rejoicing to see Ferdinand's brother, the reactionary Don Carlos (q.v.), further removed from the succession to the throne. Ferdinand died Sept. 29, 1833, and by his testament his widow was appointed guardian of her children—the young Queen Isabella and the Infanta Louisa (born 1832)—and Regent until the Queen should attain the age of 18. A civil war at once broke out in Aragon and the Basque Provinces between the opposing parties known as Carlists and Cristinos, but the Queen mother seemed indifferent to everything except the company of Don Fernandez Muñoz (1808–73), one of the royal bodyguard, whom she made her chamberlain, and with whom she was united in December, 1833, in a morganatic marriage. Her practice as Regent was to adopt the course agreeable to the Minister of the day, and thus her government was despotic under one ministry and liberal under another. She contrived, however, upon many occasions to embrace the proceedings of her more liberal or constitutional ministers; but when she sanctioned by her signature the law which deprived the communes of the right to elect their councils, a popular commotion ensued and she was compelled to resign the regency, being succeeded by the Prime Minister, Espartero. She retired to France, but continued to interfere in the affairs of Spain. After the fall of Espartero she returned to Madrid (1843) and in October, 1844, her marriage with Muñoz, who was now made Duke of Rianzares, was publicly solemnized. Her participation in the schemes of Louis Philippe in the matter of the marriage of her daughters, in 1846, and the continued exercise of all her influence in a manner unfavorable to constitutional liberty, made her the object of great dislike to the whole Liberal party in Spain. At length, in July, 1854, a revolution expelled her from the country, and she again took refuge in France. She returned to Spain in 1864, only to retire again in 1868. She died at Havre, Aug. 22, 1878. Consult Hélène Vacaresco, *Kings and Queens I have Known* (New York, 1904), and E. B. d'Auvergne, *A Queen at Bay: The Story of Cristina and Don Carlos* (ib., 1910). See SPAIN.

MARÍA CHRISTINA (1858–). A Queen of Spain. She was the daughter of Archduke Karl Ferdinand of Austria, and in 1879 married Alfonso XII of Spain, to whom she bore a posthumous son in 1886, Alfonso XIII. She acted as Regent until Alfonso XIII was declared of age, May 17, 1902, carrying on the government with much ability and tact, and so training the young King that he was often spoken of as "the best-brought-up" boy in Europe.

MARIA DE' MEDICI, mȧ-rē'ȧ dā mā'dē-chē, MARIE DE' MEDICI in English and MARIE DE MÉDICIS in French (1573–1642). The second wife of Henry IV of France. She was the daughter of Francis I, Grand Duke of Tuscany, and was born at Florence, April 26, 1573. She was married to Henry IV in 1600, and in 1601 gave birth to a son, afterward Louis XIII. Maria, though beautiful, was an obstinate, ambitious, passionate, and stupid woman. Her quarrels with Henry over her favorites and the King's gallantries became the talk of Paris. Two Italians, Leonora Galigai and her husband, Concini (see ANCRE), exercised a powerful influence over her mind and encouraged her dislike to her husband, who on his part avoided her as much as possible. She was not publicly crowned as Queen until the day before Henry's assassination (May, 1610). For the next seven years she governed as Regent, but proved incapable as a ruler. After the murder of Concini, in 1617, Louis XIII assumed royal power, aided by his favorite, the Duke de Luynes, who had put Concini out of the way. Maria was kept under surveillance in the castle at Blois. She escaped in 1619, and began a war against the King and court, being allied with certain of the disappointed nobles. The conflict was brief, and ended in the complete overthrow of Maria. In 1621 the death of Luynes led to her return to court. Maria hoped to win over Richelieu to her

party, and he was created Cardinal and Minister of State, partly through her influence. She soon found out, however, that he did not care to be ruled by her, whereupon she resolved to undermine his influence with the King. Her intrigues for this purpose in 1630 failed, and she was imprisoned in Compiègne, from whence she escaped to Brussels in 1631. She finally found her way to England to the court of her son-in-law, Charles I, but was compelled to leave London in 1641. She died at Cologne on July 3, 1642. Maria de' Medici was a lover and patron of the fine arts, and Paris owes to her the Luxembourg Palace and other public works.

Bibliography. B. Zeller, *La minorité de Louis XIII: Marie de Médicis et Sully, 1610–1612* (Paris, 1892); id., *La minorité de Louis XIII: Marie de Médicis et Villeroy* (ib., 1897); Julia Pardoe, *Life of Marie de Médicis, Queen of France* (3 vols., New York, 1902); A. P. Lord, *The Regency of Marie de Médicis* (ib., 1903); Louis Batiffol, *Marie de Médicis and the French Court in the Seventeenth Century*, translated by Mary King (ib., 1908); F. A. d'Estrées, "Mémoires du maréchal d'Estrées sur la régence de Marie de Médicis, 1610–1616, et sur celle d'Anne d'Autriche, 1643–1650," in *Société de l'histoire de Paris, publication*, vol. cccxlix (Paris, 1910). See HENRY IV; FRANCE.

MARIAGE DE FIGARO, mȧ'rē-ȧzh' de fē-gȧ'rō', LE, OU LA FOLLE JOURNÉE. A comedy by Beaumarchais, produced at the Comédie Française in 1784. It forms the continuation of *Le barbier de Séville*.

MARIAGE FORCÉ, mȧ'rē-ȧzh' fôr'sȧ', LE (Fr., the forced marriage). A one-act prose comedy ballet by Molière (1664). The piece bore the name "ballet du roi," because Louis XIV danced in it as a gypsy.

MA'RIA GENS. A plebeian gens at Rome. It was never divided into families. Its most celebrated member was Gaius Marius (q.v.), conqueror of the Cimbri and the Teutones.

MARIAGER, mä'rē-ä'gēr, PETER (1827–94). A Danish novelist, born at Nyborg. He became known through translations from the French and German, such as that of Flammarion's *Inhabited Worlds*. His original works are: *Fra Hellas, Fem antike Fortællinger* (1881); *Den sidste Lamia, og andre antike Fortællinger* (1884); *Magthaveren paa Rhodos* (1886); *Sybaris* (1887), a drama; *Dronningen af Kyrene, og andre antike Fortællinger* (1890); *Et Bryllup i Katakomberne* (1893); *Sparta* (1895). All his stories relate to Greek and Roman subjects, and some were translated into English, German, Swedish, Dutch, and Greek.

MARIA II DA GLORIA, mȧ-rē'ȧ dȧ glō'-rē-ȧ (1819–53). A Queen of Portugal. She was a daughter of Dom Pedro I, Emperor of Brazil, and a granddaughter of King John VI of Portugal. She succeeded to the Portuguese throne in 1826 on the death of her grandfather (her father Dom Pedro renouncing his claim to the throne in her favor), and, though only a child, was promised in marriage to her uncle, Dom Miguel, who was to act as Regent. The latter, however, in 1828 usurped the throne. In 1832–33 Dom Pedro successfully attacked Dom Miguel by land and sea, and in 1834 the usurper, yielding to the threats of England and France, submitted. Maria was established on the throne, and in 1835 she married the Duke Charles Augustus of Leuchtenberg, who died a few months later. The next year she married Duke Ferdinand of Saxe-Coburg-Gotha-Kohary. She was succeeded by her eldest son, Pedro V.

MARIA LESZCZYNSKA, lĕsh-chĭn'skȧ (1703–68). Wife of King Louis XV of France. She was the daughter of Stanislas Leszczynski, King of Poland, and was born in Breslau before he came to the throne. Maria accompanied her father in his wretched wanderings after his expulsion from Poland. He settled in Alsace in 1719, and there the Duke of Bourbon saw Maria and arranged her marriage with Louis XV, who was seven years her junior. She lived in retirement, devoting herself to acts of piety and charity, and died at Versailles. Consult: D'Armaille, *La reine Marie Leszczynska* (2d ed., Paris, 1870); De Nolhac, *La reine Maria Leczinska* (ib., 1900); id., *Louis XV et M. Leczinska* (ib., 1902).

MARIA LOUISA (1791–1847). The second wife of the Emperor Napoleon I. She was born Dec. 12, 1791, the daughter of the Archduke Francis, afterward the Emperor Francis I of Austria, and was married to Napoleon on April 2, 1810. The marriage seemed to give stability to the Bonaparte dynasty, and in some measure to afford a prospect of peace to Europe. On March 20, 1811, she bore a son, who was called King of Rome. On the abdication of Napoleon she was not permitted to follow her husband, but went with her son to Schönbrunn, where she remained during the Hundred Days and until 1816, when she received the duchies of Parma, Piacenza, and Guastalla. In 1822 she contracted a morganatic marriage with her chamberlain, Count von Neipperg, who had been her lover before and by whom in 1821 she had a son, the Duke of Montenuovo. Count von Neipperg died in 1829. In 1833 she entered into a secret marriage with Count Bombelles, likewise her chamberlain. She died at Vienna, Dec. 17, 1847.

Bibliography. A. L. Imbert de Saint-Amand, *The Happy Days of the Empress Marie Louise* (New York, 1890–91); id., *Marie Louise and the Invasion of 1814* (ib., 1892); id., *Marie Louise et le Duc de Reichstadt* (Paris, 1892); id., *Marie Louise, the Island of Elba, and the Hundred Days* (New York, 1894); id., *Marie Louise and the Decadence of the Empire* (ib., 1902); H. A. Guerber, *Empresses of France* (ib., 1906); E. E. Cuthell, *An Imperial Victim* (2 vols., ib., 1912). See NAPOLEON I.

MARIA LOUISA, ORDER OF. A Spanish order founded by Charles IV, in 1792, and bestowed by the Queen on women of the old nobility. The recipient is expected to devote herself to charitable and pious works. The order has one class.

MARÍA LUISA, mȧ-rē'ȧ lōō-ē'sȧ (1751–1819). Daughter of Duke Philip of Parma and wife of King Charles IV of Spain (q.v.), whom she married in 1765 while he was still Prince of Asturias. When he succeeded to the crown in 1788 she and her lover, Godoy, Duke of Alcudia, managed to secure practical control of the government. After the revolution in 1808, which placed Ferdinand VII on the throne of his father, she and her husband fled to France and appealed to Napoleon, who induced the young King to restore the crown to his father and then persuaded the latter to cede it to him; whereupon he promptly bestowed it on his brother Joseph (q.v.). María spent the remainder of her life in exile at Marseilles and Nice and latterly at Rome, where she died.

MARÍA LUISA (1782–1824). Queen of Etruria, daughter of Charles IV of Spain (q.v.) and María Luisa of Parma (q.v.). She married Louis, eldest son of Duke Ferdinand of Parma, in 1795. In 1801 her husband was invested by Napoleon with the Kingdom of Etruria (Tuscany), the consideration being that Parma should revert to France on the death of Ferdinand. When Louis died in 1803, her son, Charles Louis, succeeded to the Etrurian throne under her regency, but the Kingdom was incorporated in 1807 in the French dominions. She then retired to Spain, but after her father's abdication lived in Parma and later in Nice. An attempt to flee to England was frustrated in 1811, and she was forced to seek refuge in a cloister in Rome, where she remained until 1814. The Congress of Vienna in compensation gave to the young Prince the city of Lucca, which his mother governed as Regent until he came of age, and in a subsequent treaty it was stipulated that Parma should revert to him on the death of the ex-Empress Maria Louisa. She was beatified by the Pope in 1876. The Queen's memoirs were published by d'Argy, entitled *Mémoires de la reine d'Etrurie* (Paris, 1814).

MARIAMNE, mā'rĭ-ăm'nē. Wife of Herod the Great (q.v.). She belonged to the family of the Hasmonæans or Maccabees (q.v.), being the granddaughter of Hyrcanus II. Although she was deeply beloved by her husband, he had her put to death in a fit of jealousy, and remorse for the act embittered the later years of his life. She is famed for her beauty as well as her tragic fate.

MARIAMNE. The title of plays by Alexandre Hardy (1610), Tristan l'Ermite (1637), and Voltaire (1723), based on the story of Mariamne, wife of Herod the Great.

MARIANA, mä'rē-ä'nȧ. A tribe of South American Indians. See MARANHA.

MARIANA, mā'rĭ-ăn'ȧ. In Shakespeare's *Measure for Measure*, the charming and womanly lover of Angelo. Tennyson's *Mariana in the Moated Grange* and *Mariana in the South* were based on her character.

MARIANA. The name given by Capt. John Mason to the land granted him by the Council for New England on March 9, 1621–2. The patent, which was the second granted by the Council, covered the lands lying between the Naumkeag (Salem) and Merrimac rivers, with the islands within 3 miles of the shore, and was included in the present territory of Massachusetts.

MARIANA, mä'rē-ä'nȧ, JUAN (1536–1623 or 1624). A distinguished Spanish historian and scholar, born at Talavera. In 1553 he entered the Order of the Jesuits. His early studies in languages and theology were so brilliant that he was appointed to teach in the schools of his order, first at Rome (where the celebrated Bellarmine [q.v.] was one of his scholars) in 1561, afterward in Sicily in 1565, and finally in Paris in 1569. After a residence there of seven years he settled at Toledo, where he resided till his death, at an extreme old age. His retirement, however, was passed in sustained literary activity. From an early period he devoted himself to writing a history of Spain (1592–1605). The original of this history was Latin, the elegance and purity of which have secured for Mariana a place among the most distinguished of modern Latinists. Mariana himself published a Spanish translation, which still remains one of the classics of the language. Among his other productions are his scholia of the Bible and an edition of the works of Isidore of Seville. But the most celebrated of the works of Mariana is his well-known treatise, *De Rege et Regis Institutione* (1599), in which is raised the important question whether it is lawful to overthrow and kill a tyrant. Mariana decides that it is right for every man to do so, even where the tyrant is not a usurper, but a lawful king, and esteems Jacques Clément (q.v.) equally with Brutus. Mariana's views on other subjects were broad-minded and liberal. In 1609 he published a volume *Tractatus VII Theologici et Historici*, which was placed upon the Index Expurgatorius and caused his arrest by the Inquisition. His *Discursus de Erroribus qui in Forma Gubernationis Societatis Jesu Occurrent* (Bordeaux, 1625) was reprinted by Charles III as a defense of his order banishing the Jesuits from Spain in 1767. Consult: Juan Mariana, *Historia general de España: ilustrada en esta nueva impresión de tablas cronológicas, notas, y observaciones críticas: con la vida del autor* (9 vols., Valencia, 1783–96); Leopold von Ranke, *Zur Kritik neuerer Geschichtschreiber* (Leipzig, 1874); Georges Cirot, *Mariana, historien* (Paris, 1905).

MARIANA ISLANDS. See LADRONE ISLANDS.

MARIANI, mä'rē-ä'nē, ANGELO (1822–73). A famous Italian orchestral conductor, born at Ravenna. He received his entire musical education at the Liceo Filarmonico in Bologna, where he was a pupil of Rossini. In 1844 he began his career as conductor in Messina, whence he went to Milan. Here he found ample opportunity to display his remarkable gifts, so that in 1847 he was called to Copenhagen as court conductor. At the outbreak of the revolution of 1848, however, he hastened back to his native country and joined the colors. In 1852 he became conductor at the Teatro Carlo Felice in Genoa. Before long he had won the reputation of being the greatest conductor in all Italy. About 1860 he was called to the municipal theatre of Bologna, where he began a propaganda for Wagner, at a time when in Italy Lohengrin was regarded as a monstrosity. In 1873 he returned to Genoa, where he died a few weeks after his arrival. He composed a *Requiem* and several cantatas.

MARIANISTS. See MARISTS.

MAR'IAN'NA. A city and the county seat of Lee Co., Ark., 43 miles southwest of Memphis, Tenn., on L'Anguille River, at the head of navigation, and on the St. Louis, Iron Mountain, and Southern Railroad (Map: Arkansas, E 3). It carries on a considerable trade in cotton, and has cotton gins, cottonseed-oil mills, lumber mills, and manufactories of headings, box shooks, and spokes. The city contains an Elks' Home, courthouse, public park, and fine city hall building. The water works are owned and operated by the municipality. Pop., 1900, 1707; 1910, 4810.

MARIANNE, mȧ'rē-ȧn', OU LES AVENTURES DE LA COMTESSE DE. . . . An unfinished romance by Marivaux (1731–41), to which a second part was added in 1755 by Madame Riccobini. The novel has been said to be the origin of *Pamela*. It is important as the first novel of analysis rather than of incident, and contains minute pictures of bourgeois and conventual life.

MARIANNE (mā'rĭ-ăn') **ISLANDS.** See LADRONE ISLANDS.

MAR'IA'NUS SCO'TUS (1028–c.1082). An Irish chronicler, whose real name was Moelbrigte. He took the vows of a monk at the age of 24 and, leaving Ireland, entered the monastery in Cologne in 1056. There he remained for two years. He became a recluse in Fulda in 1059, and continued as such all the rest of his life, which, after 1069, was spent at Mainz. His claim to remembrance rests upon a *Chronicon Universale*, extending from the birth of Christ to 1082, which contains extracts from Bede and other chroniclers, besides new material. The first printed edition was made at Basel in 1559, and five have appeared since then, including one published with translation at Dublin in 1892.

MARIANUS SCOTUS (died probably 1088), the contemporary and namesake of the above, was first abbot of the monastery of St. Peter, Ratisbon, of which he was one of the founders. He was born in Ireland. His calligraphy made him famous, and he is known as a saint.

MARIA (mȧ-rī'ȧ) **OF AUSTRIA** (1505–58). A Queen of Hungary, a daughter of Philip the Fair of Burgundy and Joan of Castile, and sister of the emperors Charles V and Ferdinand I of Hapsburg. Born at Brussels in 1505, she married Louis II of Hungary at 17 and was widowed at 21, her husband being killed by the Turks at Mohács. In 1530 she was appointed Governor-General of the Netherlands by Charles V, succeeding Margaret of Austria. There she ruled ably and firmly for 24 years. In general, she aided Charles in his foreign policy, often acted as mediator between him and Ferdinand, and resigned from her office in the Netherlands upon the abdication of Charles (1555). She retired to Spain, and died at Cigales. Maria was a patron of arts and letters, and left a valuable collection of manuscripts now in the Burgundian Library of Brussels. Consult T. Juste, *Les Pays-Bas sous Charles V; Vie de Marie de Hongrie* (Brussels, 1861).

MARIA PIA, mȧ-rē'ȧ pē'ȧ (1847–1911). A Queen of Portugal, daughter of Victor Emmanuel II of Italy, born at Turin. In 1862 she married Luiz I of Portugal. Upon the accession to the throne of her son Carlos I (Oct. 9, 1889), she became the dowager Queen. On Feb. 1, 1908, King Carlos and Prince Luiz, the heir apparent, were assassinated in the streets of Lisbon and Maria Pia's grandson Dom Manuel ascended to the throne. Of a very kindly disposition, she lived in close retirement after the accession of Manuel and devoted herself to charitable and philanthropic work. When Manuel was overthrown, in 1910, she went to live with her sister, Princess Clotilda, near Turin, Italy.

MARIA STUART, mȧ-rē'ȧ stōō'ȧrt. A tragedy by Schiller, printed and presented in 1800.

MARIA THERESA, mȧ-rī'ȧ te-rē'sȧ (1717–80). Queen of Hungary and Bohemia, Archduchess of Austria, and wife of the German Emperor Francis I. She was the daughter of the Emperor Charles VI (q.v.) and was born at Vienna, May 13, 1717. By the Pragmatic Sanction (q.v.) her father sought to secure from the European Powers her undisputed succession to the Hapsburg dominions in the absence of a male heir. On Feb. 12, 1736, she married Francis Stephen, Duke of Lorraine (soon after Grand Duke of Tuscany), and on the death of her father, Oct. 20, 1740, she succeeded to the hereditary possessions of the house of Austria, which, in addition to the German, Hungarian, and Slavic lands, included Lombardy and the Belgian Netherlands. She found the monarchy exhausted, the finances embarrassed, the people discontented, and the army weak; while Prussia, Bavaria, Saxony, Naples, and Sardinia, stirred up by France, put forward claims to portions of her dominions, chiefly founded on the extinction of the male line of the house of Hapsburg and in contravention of the Pragmatic Sanction. The War of the Austrian Succession (1740–48) ensued, in which England supported Austria. (See SUCCESSION WARS.) Frederick II of Prussia soon made himself master of Silesia; Spain and Naples laid hands on the Austrian dominions in Italy; and the French, Bavarians, and Saxons overran the hereditary Austrian territories. The young Queen was in the utmost danger of seeing her realms dismembered, but was saved by the chivalrous fidelity of the Hungarians, the assistance of England, and most of all by her own resolute spirit. Her enemies quarreled among themselves, and the War of the Austrian Succession was terminated by the Peace of Aix-la-Chapelle in 1748. Maria Theresa lost Silesia and Glatz and the duchies of Parma, Piacenza, and Guastalla. In 1745 her husband (Francis I) had been raised to the Imperial throne of Germany on the death of Charles VII. During the period of peace that followed she initiated great financial reforms. Agriculture, manufactures, and commerce flourished, the national revenues greatly increased, and the burdens of the peasantry were diminished. All this time she was strengthening her resources in anticipation of a renewal of the war with Frederick the Great. Her indomitable pride and her devout Catholicism would not permit her to relinquish Silesia as long as she could fight for it. She found in Kaunitz (q.v.) a minister possessed of the wisdom and energy requisite for the conduct of affairs, and in him she placed almost unlimited confidence. He effected the alliance with France which disturbed all existing international arrangements (1756). In the Seven Years' War (q.v.) which followed Maria Theresa and her allies well-nigh achieved the ruin of Frederick the Great, but the generalship of the indomitable Prussian King, the incapacity of the generals of Louis XV, and Russia's abandonment of the cause of Maria Theresa enabled Frederick to emerge from the struggle with his dominions intact. The war reduced Austria to a state of great exhaustion, but when it was concluded Maria Theresa renewed her efforts to promote the national prosperity, and made many important reforms, ameliorating the condition of the peasantry and mitigating the penal code. Her son, Joseph II, became Holy Roman Emperor on the death of her husband in 1765. Maria Theresa associated him with herself in the government of her hereditary states, but in reality committed to him the charge only of military affairs. She joined with Russia and Prussia in the first partition of Poland (1772), Galicia falling to her share. She also compelled the Porte to give up Bukowina to her (1777). The brief War of the Bavarian Succession (1778–79) ended in her acquisition of a district along the Inn (Innviertel), but led to the formation of the Fürstenbund, or League of German Princes, which set bounds to the Austrian power in Germany. Maria Theresa died in Vienna, Nov. 29, 1780. Throughout her reign she displayed a resolute and masculine charac-

ter. Although a zealous Roman Catholic, she maintained the rights of the crown against the papal power and endeavored to correct some of the worst abuses in the church. She prohibited the presence of priests at the making of wills, abolished the right of asylum in churches and convents, and suppressed the Inquisition in Milan. Her son succeeded her as Joseph II (q.v.).

Bibliography. Kern, "Die Reformen der Kaiserin Maria Theresias," in *Historisches Taschenbuch*, xi (Leipzig, 1809); Adam Wolf, *Aus dem Hofleben Maria-Theresias* (Vienna, 1859); Alfred von Arneth, *Geschichte Maria Theresias* (10 vols., ib., 1863–79); C. J. V. A. Broglie, *Frederick the Great and Maria Theresa* (2 vols., London, 1883); id., *Marie Thérèse impératrice, 1744–46* (Paris, 1888); Villermont, *Marie Thérèse, 1717–80* (ib., 1895); J. F. Bright, *Maria Theresa* (London, 1897); Hans von Zwiedineck-Südenhorst, *Maria Theresia* (Bielefeld, 1905); M. M. Moffatt, *Maria Theresa* (New York, 1911), containing an exhaustive bibliography. Her correspondence has been edited by Kervyn de Lettenhove, *Lettres inédites de Marie Thérèse et de Joseph II*, Royal Academy of Belgium, and by Alfred von Arneth (Vienna, 1867–81).

MARIA THERESA, Order of. An Austrian order conferred exclusively for distinguished conduct in war, founded in 1757. The monarch is the head of the order. Pensions ranging from 600 to 6000 florins are given to members. The distinction is very sparingly conferred.

MARIA-THERESIOPEL. See Theresiopel.

MARIAZELL, mä'rē-ä-tsĕl'. A village in the Crownland of Styria, Austria, 2810 feet above the sea, 58 miles southwest of Vienna (Map: Austria, D 3). It is the greatest pilgrim resort of Austria-Hungary, being visited annually by about 150,000 people. The church containing a famous carved wood image of the Virgin was originally founded in 1363 and rebuilt in 1827. It contains a valuable Madonna by an unknown Italian master and a silver altar. In the vicinity there are large iron-foundry and paper-pulp works. Pop., 1900, 1499.

MARIBOJOC, mä'rē-bō-hŏk'. A town of Bohol, Philippines, situated on high ground on the southwest coast, 8 miles north of Tagbilaran. It is an important road centre. Pop., 1903, 11,830.

MARICOPA, mä'rē-kō'pȧ, or Coco-Maricopa. A tribe of Yuman stock (q.v.), formerly living about the junction of the Gila and Colorado rivers, southwestern Arizona. About 70 years ago, on account of the hostility of the Yuma, they moved up the Gila and confederated with the Pima (q.v.), with whom they are now living upon the Gila River reservation. They depend upon agriculture by irrigation and formerly raised large crops. They live in houses of cornstalks and straw woven upon a framework of poles, with storehouses and arbors surrounding. Their women are superior potters, basket makers, and weavers of native cotton. The men formerly wore only the G string, while the women wound a strip of cotton cloth about the waist. The hair was worn flowing and cut across the forehead. At present they are practically civilized through missionary effort and have a high reputation for industry and general good qualities. They number about 386. A sample of their work is shown on the Plate of Indian Baskets. See Yuman Stock. Consult Frank Russell, "Pima Indians," in *United States Bureau of American Ethnology, Twenty-Sixth Annual Report* (Washington, 1908).

MARICOURT, mȧ'rē'kōōr', Sieur de. See Le Moyne, Paul.

MARIE (Adélaïde Thérèse Hilda Antoinette Wilhelmine), mȧ'rē' ȧ'dȧ'lȧ'ēd' tȧ'rēz' ēl'dȧ' ăn'twȧ'nĕt' vēl'ĕl'mēn' (1894–), Grand Duchess of Luxemburg. She was the daughter of William Alexis (1852–1912), whose father, Adolphus of Nassau, became Grand Duke of Luxemburg in 1890 under the rule incorrectly termed the Salic Law (q.v.) upon the death of William III of Holland and the failure of the direct male line. In 1907, when her father had been Grand Duke for two years, as he had no direct male heir, the succession was made hers. Her father died on Feb. 25, 1912, and she succeeded on June 18 of that year. Her mother was Maria Anna (born 1861), daughter of Dom Miguel (1802–66) of Portugal. The young Grand Duchess bitterly objected to the breach of the neutrality of Luxemburg by Germany in 1914 and was even said to have attempted in person to stop the entry of German troops.

MARIE AMÉLIE DE BOURBON, mȧ'rē' ȧ'mȧ'lē' de bōōr'bōn'. Queen of the French. See Amalie, Marie.

MARIE ANTOINETTE, ăn'twȧ'nĕt' (1755–93). Queen of France and consort of Louis XVI. She was the youngest daughter of Emperor Francis I and Maria Theresa and was born at Vienna, Nov. 2, 1755. At the age of 14 she was betrothed to the French Dauphin and in the following year was married at Versailles. Her reception by her husband and the King, Louis XV, was flattering, but her naïveté, unceremonious pleasantry, and detestation of rigid etiquette scandalized Versailles. Soon after the accession of Louis XVI (1774), her enemies, of whom the chief was the Count of Provence, younger brother of the King, who subsequently ruled as Louis XVIII, circulated libels accusing her of constant intrigues. Her love of luxury and extravagance and her indifference to the miseries of the people, combined with her attempts to use her influence with Louis XVI to shape the foreign policy of France in accordance with the interests of Austria, made her unpopular with the people and gained her the epithet of "the Austrian woman" (*l'Autrichienne*). The affair of the Diamond Necklace (q.v.), in 1785, hopelessly compromised her good name in the eyes of the public. Her influence on the internal politics of the country was not more fortunate. Loménie de Brienne and Calonne were ministers of her choice, and she shared the opprobrium called down upon them for their reckless squandering of the national finances. She strongly opposed the summoning of the Notables (1787) and of the States-General (1789); and she had good reason to dread their convocation, for one of the very first things the Notables did was to declare the Queen the cause of the derangement of the finances. From the first hour of the Revolution she was an object of fanatical hatred to the mob of Paris, who knew that she was conspiring with her brother, Leopold II of Austria, for the reëstablishment of the absolute monarchy. In hours of crisis her resolute bearing spurred on the weak-willed Louis XVI to spasmodic assertions of his authority without bringing him to take a decisive step in defense of his rights. After the removal of the royal

family from Versailles to the Tuileries (Oct. 6, 1789) she attempted on various occasions to conciliate the good will of the people, but failed before the vindictive enmity of the Parisian populace. Out of personal antipathy to Mirabeau she could not be brought to accept the aid of the man who alone might have saved the monarchy from destruction. At last she resolved on flight. Her husband long refused to abandon his country, but she could not go without him, and finally the King consented. The flight took place on the night of June 20, but the royal fugitives were recognized and turned back at Varennes. The flight to Varennes only served to confirm the popular belief as to the Queen's intrigue with foreign powers, and, as a matter of fact, there is no doubt that Marie Antoinette had corresponded and continued to correspond with her brother relative to the invasion of France by an Austrian army for the purpose of rescuing the royal family. On June 20, 1792, a mob invaded the Tuileries, forced Louis XVI to don a liberty cap, and heaped insults on the Queen as they filed past her. On August 10 came the final storming of the Tuileries. Marie Antoinette's guards were murdered at her chamber door, and the unhappy Queen was compelled to seek refuge with her husband in the hall of the Convention, whence they were consigned on the 13th as prisoners to the Temple. Louis XVI was executed on Jan. 21, 1793. Marie Antoinette was separated from her son July 3, 1793, and on August 1 was removed to the Conciergerie. Twice while she was a prisoner in the Temple were unsuccessful attempts made to effect her escape. On October 14 she was brought before the Revolutionary Tribunal and charged with fomenting civil war and lending counsel to the foreign enemies of France. Testimony against her was given by Hébert, who sought to blacken her personal character with trumped-up charges. She was found guilty of treason after a two days' trial, was condemned to death on October 16, and was executed the same day.

The tragic fate of Marie Antoinette has given rise to a voluminous literature, in which the Queen has been depicted now as the victim, the sainted martyr, of the Revolution, now as the embodiment of the luxury, stupidity, and apathy towards the miseries of the people which characterized the powers of the old régime.

Bibliography. The memoirs of Madame de Campan, lady in waiting to the Queen, are inaccurate but important. They were first published in France in 1822 and have since appeared in numerous French and English editions. The latest edition in English is entitled *Memoirs on Marie Antoinette and her Court* (2 vols., Boston, 1909). Much of the Queen's correspondence has been published by Von Arneth, D'Hunolstein, De Reiset, F. Feuillet des Coucher, and Geffroy. The memoirs of the Prince de Ligne and the Duke de Choiseul are of value. Other memoirs by contemporaries are: J. Weber, *Mémoires concernant Marie-Antoinette* (London, 1804–09); *Mémoires de M. le baron de Besenval* (Paris, 1805); *Mémoires de la baronne d'Oberkirch* (ib., 1853); E. Bavoux, *Mémoires secrets de J. M. Augeard, secrétaire des commandements de la reine Marie-Antoinette* (ib., 1866); Madame Vigée-Le-Brun, *Mes souvenirs* (ib., 1867); *Mémoires de Mme. la duchesse de Tourzel* edited by the Duc de Cars (ib., 1883). Consult also: Jacob, "Ueber den politischen Einfluss der Königin Marie Antoinette von Frankreich," in *Historisches Taschenbuch*, vol. ix (Leipzig, 1838), with a list of authorities; E. and J. de Goncourt, *Histoire de Marie Antoinette* (6th ed., Paris, 1884); A. L. Imbert de Saint-Amand, *Marie Antoinette and the End of the Old Regime* (New York, 1896); A. L. Bicknell, *The Story of Marie Antoinette* (ib., 1897); A. L. Imbert de Saint-Amand, *Marie Antoinette at the Tuileries* (ib., 1897); Pierre de Nolhac, *Marie Antoinette, dauphine* (Paris, 1897); id., *La reine Marie Antoinette* (ib., 1898); A. L. Imbert de Saint-Amand, *Marie Antoinette and the Downfall of Royalty* (New York, 1898); Hilaire Belloc, *Marie Antoinette* (ib., 1909); A. C. P. Haggard, *Louis XVI and Marie Antoinette* (2 vols., London, 1909); Pierre Ladoué, *Les panégyristes de Louis XVI et de Marie Antoinette depuis 1793 jusqu'à 1912: essai de bibliographie raisonnée* (Paris, 1912); O. G. von Heidenstam, *Marie Antoinette, Fersen, et Barnave: leur correspondance* (ib., 1913).

MARIE CHARLOTTE AMÉLIE. See CARLOTTA.

MARIE DE FRANCE, de fräns (?twelfth century). The earliest French poet. She was born in France. She dedicated her fables to a certain William, whom some have identified with William Longsword of Salisbury; and she alludes in her *Fables* to a king, sometimes identified with Henry III of England. If these hypotheses be correct, it would appear that she lived in England and in the early thirteenth century, but textual evidence points to an earlier date. She wrote *Lais* and a collection of animal fables, a so-called *Ysopet*. A poem of 2300 lines on St. Patrick's purgatory (*L'Espugatoire Seint Patriz*) she derived from a Latin treatise by Henry of Saltrey, written before 1185. The *Lais* are 14 narrative poems, ranging in length from 100 to 1200 verses. Of these the best known is the *Chèvrefeuille*, describing an episode in the loves of Tristan and Iseult (Isolde); the finest is *Eliduc*. Noteworthy also are *Le rossignol*, *Les deux amants*, *Yonec* (a fairy tale of the bluebird), and *Lanval*. These Marie got from Kymric sources. Marie says she translated her 103 fables from an English version by King Alfred (*roi Alvrez*), or, as two manuscripts read, "King Henry." The English version from which she worked is lost; the Latin that stood behind it comprised nearly all the collection of Romulus (ninth century), supplemented from the Jewish-Oriental fables preserved in the collection of Berachyah and Pisore Alphonse, and apparently also from early native sources. The poems of Marie de France are edited by Roquefort (Paris, 1820), and better by Warnke in vol. iii of *Bibliotheca Normannica*, with an essay by Röhler (Halle, 1885). Consult: Bédier, "Les Lais de Marie de France," in *Revue des Deux Mondes* (Paris, 1891), and on the *Ysopet*, a chapter by Sudre in Petit de Julleville, *Histoire de la langue et de la littérature française*, vol. ii (ib., 1896); also: Warnke, *Die Quellen des Esope der Marie de France* (Halle, 1900); *Marie de France: Seven of her Lays Done into English, by Edith Rickert* (London, 1901); *Three Lays of Marie de France Retold in English Verse*, by F. B. Luquiens (New York, 1911), containing a bibliography; Alice Kemp-Welch, *Of Six Mediæval Women* (London, 1913).

MARIE DE' MEDICI. See MARIA DE' MEDICI.

MARIE GALANTE, gä'länt'. An island in the West Indies, one of the Lesser Antilles. It

belongs to France and lies 17 miles southeast of Guadeloupe, of which it is an administrative dependency (Map: West Indies, G 4). It is nearly circular in shape; area, 58 square miles. It consists of a limestone plateau, 300 to 600 feet high, surrounded by steep rocky shores. The climate is healthful and the soil is fertile, the chief products being sugar, coffee, and cotton. The chief town is Grandbourg, on the southwest coast. The population in 1901 was 15,181, consisting mostly of negroes and mulattoes. Marie Galante is so called from the name of the ship commanded by Columbus when he discovered the island in 1493.

MARIENBAD, mȧ-rē′*e*n-bät. A famous watering place of Europe, situated near the west border of Bohemia, Austria, amidst pine-clad hills, at an altitude of 2060 feet, 36 miles northwest of Pilsen (Map: Austria, C 2). The visitors number about 30,000 annually. It is a small town, with a fine Roman Catholic church (1844–50) in Byzantine style, a tasteful synagogue, English and Russian churches, a theatre, four baths, including the Neubad, built in 1895, and a military Kurhaus. Its fine promenading grounds are adorned with monuments. Its 10 springs containing Glauber's salt do not differ essentially from those of Karlsbad except that they are cold. They range in temperature from 48° F. to 53° F. The principal springs are the saline Kreuzbrunnen and Ferdinandsbrunnen, used both for bathing and drinking. They yield yearly over a million bottles for export. The Marienquelle is used only for bathing, and contains a large proportion of carbonic acid. The chalybeate Ambrosius- and Karolinenbrunnen are used both for drinking and for bathing. Besides the above-mentioned springs there are mud baths and a hydropathic establishment. Considerable quantities of salt are exported. Although the springs of Marienbad enjoyed a local reputation long before the nineteenth century, it was only in 1808 that the first bathing establishment was opened and the place assumed its present name. Pop., 1900, 4588; 1910, 6280, chiefly Germans.

MARIENBURG, mȧ-rē′*e*n-bu̇rk. An old town in the Province of West Prussia, 30 miles south-southeast of Danzig, on the Nogat River (Map: Germany, H 1). It is chiefly interesting because it was for one and a half centuries the seat of the grand masters of the Teutonic Order. These knights built the Marienburg Schloss, one of the largest and most strongly fortified buildings in Germany and one of the most remarkable secular buildings of the Middle Ages. It has a sixteenth-century town hall, a notable monument to Frederick the Great, a teachers' seminary, a Gymnasium, and an agricultural school. Marienburg remained in the hands of the Knights till 1457, when it was taken by the Poles. Marienburg was occupied by the Russians during their first offensive campaign against the Germans in the European War which began in 1914. They were later compelled to evacuate it. (See WAR IN EUROPE.) The town has large wool-cleaning works and manufactures machinery, chemicals, pottery, bricks, and cotton wadding. It trades in grain, wood, linen, and horses. Pop., 1900, 10,732; 1910, 14,019. Consult Bergau, *Das Ordenshaupthaus Marienburg in Prussia* (Berlin, 1871).

MARIENWERDER, mȧ-rē′*e*n-vĕr′dĕr. A town in the Prussian Province of West Prussia, on a tributary of the Vistula, 45 miles south of Danzig (Map: Germany, H 2). It has a fourteenth-century cathedral with tombs of the grand masters of the Teutonic Order and a castle built by the Teutonic Knights, the founders of the town in 1233. The principal industries are sugar refining and the manufacture of cloth, machinery, lumber, print goods, soap, vinegar, and dairy products. There is a considerable trade in fruit. Pop., 1900, 9686; 1910, 12,983.

MARIE THÉRÈSE, mȧ′rē′ tȧ′rĕz′, OF AUSTRIA (1638–83). A wife of Louis XIV of France, daughter of Philip IV of Spain, born in Madrid. By the terms of the Peace of the Pyrenees (1659) she was married to Louis XIV (1660), giving up all claims to the Spanish throne. She lived very unhappily with Louis, but at length seemed to find comfort in religion. Consult H. L. Duclos, *Mme. de la Vallière et Marie Thérèse* (2d ed., 2 vols., Paris, 1870).

MARIETON, mȧ′rē′ȧ′tôn′, PAUL (1862–1911). A French poet and critic, born at Lyons. He early became associated with the Provençal movement in southern France and took a prominent part in that revival. (See FÉLIBRIGE.) He was the founder and editor of the *Revue Félibréene*. His writings include: *Souvenance* (1884); *La viole d'amour* (1886); *Hellas* (1888); *La terre provençale* (1890); *Le voyage des Félibres et des Cigaliers sur le Rhône et le littoral* (1892); *Le livre de mélancolie* (1896); *Une histoire d'amour: George Sand et Alfred de Musset* (1897; 2d ed., 1903); *Le voyage des Félibres et des Cigaliers sur le Rhône et Vaucluse* (1895); *Jasmin (1798–1864)* (1898); *Hippolyta* (1902); *Le théâtre antique d'Orange et ses représentations* (1903, 1908); *Les epigrammes* (1909).

MARIETTA, mā′rĭ-ĕt′ȧ *or* măr′ĭ-. A city and the county seat of Cobb Co., Ga., 20 miles north by west of Atlanta, on the Louisville and Nashville, the Nashville, Chattanooga, and St. Louis, and the Western and Atlantic railroads (Map: Georgia, B 2). It has the Clarke Library and a city park. In the large National Cemetery here there are 10,532 graves, 2967 of unknown dead. Kenesaw Mountain (q.v.) is situated a short distance west. The city is the centre of a farming and stock-raising district and has extensive marble works, chair factories, knitting mills, machine works, table factory, etc. Marietta, first incorporated in 1852, is governed, under a charter of 1885, by a mayor, elected biennially, and a city council, chosen at large. The water works and electric-light plant are owned by the municipality. Pop., 1900, 4446; 1910, 5949.

MARIETTA. A city and the county seat of Washington Co., Ohio, 115 miles by rail southeast of Columbus, at the junction of the Ohio and the Muskingum rivers, the former being spanned by a bridge connecting with Williamstown, W. Va., and on the Baltimore and Ohio, the Pennsylvania Company, and the Marietta, Columbus, and Ohio railroads (Map: Ohio, H 7). It is the seat of Marietta College (q.v.), with a large library, and has a city park, set apart in 1788, and the oldest church organization and the oldest building in the Northwest Territory. The latter, known as the "Two-Horned Church," was once the office of the Ohio Land Company. It was destroyed by fire in 1905, but has since been rebuilt of brick along its original lines. In the cemetery here are buried many Revolutionary soldiers. The city is in an agricultural, petroleum, and coal region,

has large commercial interests through its river trade, and it manufactures flour, lumber products, stoves, tables and furniture, cars, tanned leather, carriages and wagons, refined petroleum, boats, oil-well tools, boilers, wooden bicycle rims, brick, harness, glass, caskets, etc. The government is administered under the Ohio municipal code of 1902 by a mayor, a unicameral council, a board of public safety appointed by the mayor with the concurrence of two-thirds of the council, and a board of public service elected by the people. All these officers are chosen for a term of two years. The city owns and operates the water works and electric-light plant. Pop., 1900, 13,348; 1910, 12,923; 1920, 15,140.

Marietta, the first settlement within the present limits of Ohio, was founded in 1788 by Rufus Putnam and a colony from New England under the authority of the Ohio Company (q.v.). It was named in honor of Marie Antoinette. In July, 1788, the Northwest Territory was formally organized here by Governor Arthur St. Clair. Blennerhasset Island, 12 miles below, was the scene of various incidents in the Burr Conspiracy. Marietta was first incorporated, as a town, in 1800. In 1890 the village of Harmar, where, in 1785, Fort Harmar had been built, was annexed. Consult Hoar, *Oration at the Celebration of the Centennial of the Founding of the Northwest at Marietta* (Washington, 1888).

MARIETTA COLLEGE. A coeducational institution of learning at Marietta, Ohio, founded as Muskingum Academy in 1797 by pioneers of the Ohio Company, chartered in 1835. It has a regular college course leading to the B.A. degree. The library, of over 60,000 volumes, is especially strong in the history of the old Northwest Territory. In 1914–15 the college had a faculty of 17 instructors and an attendance of 200. Its endowment was $700,000, its income $40,000, the value of its grounds and buildings $350,000, and the total value of the college property $1,000,000. The president in 1915 was George W. Hinman, Ph.D.

MARIETTE, mȧ'rē'ĕt', Auguste Edouard (1821–81). A French Egyptologist, born at Boulogne-sur-Mer. He became in 1849 assistant in the Egyptian museum at the Louvre. He was sent to Egypt to collect Coptic manuscripts, but there became interested in the ruins of Memphis and in excavations. Aided financially by the French government and by the Duke de Luynes, he excavated, in 1851, the Serapeum near the modern Sakkara and the tombs of the Apis bulls, finding thousands of inscriptions and statues, as well as many mummies of sacred bulls and cows, which went chiefly to Paris. In 1854 he returned to Paris and was made curator in the Egyptian Museum. In 1858 he went to Egypt and became director of the governmental excavations and curator of the monuments. Acting in this capacity, he cleared most of the ancient temples, the great Sphinx, the tombs at Sakkara, and other historic spots from sand and rubbish, and formed the Egyptian National Museum. In 1873 he received the biennial prize of 20,000 francs from the Institute of France. The Egyptian government gave him the title of Bey, later that of Pasha. He died in 1881 and was buried in a huge stone sarcophagus standing before the museum. He produced, with the aid of collaborators and draftsmen, many books, among them: *Mémoire sur la mère d'Apis* (1856); *Renseignements sur les 64 apis trouvés dans les souterrains du Sérapéum* (1856); *Choix de monuments et de dessins, découverts ou exécutés pendant le déblayement du Sérapéum de Memphis* (1856); *Le Sérapéum de Memphis* (1857 et seq.); *Aperçu de l'histoire d'Egypte* (1867); *Abydos* (1870); *Les papyrus égyptiens du musée de Boulaq* (1872–77); *Denderah* (1869–75); *Monuments divers* (1872–82); *Deir-el-Bahari* (1877); *Karnak* (1875); *Voyage dans la Haute Egypte* (1878; 2d ed., 1893); *Catalogue des monuments d'Abydos* (1880); *Les Mastabas de l'ancien empire* (1881–89). The *Œuvres diverses d'Auguste Mariette*, edited by Maspero, began to appear in Paris in 1904 Consult Edouard Mariette, *Mariette Pacha* (Paris, 1904), and G. C. C. Maspero, *Notice biographique sur Auguste Mariette* (ib., 1905).

MARIGLIANO, mä'rē-lyä'nō. A town in the Province of Caserta, Italy, 10 miles northeast of Naples. It has a fine church and a palace. It manufactures spirits and markets grain and wine. Pop. (commune), 1901, 12,491; 1911, 12,502.

MARIGNANO, mä'rē-nyä'nō. See Melegnano.

MARIGNOLLI, mä'rēn-yōl'lē, Giovanni de' (fl. 1290–1357). An Italian traveler, born at Florence. He was one of four legates of Pope Benedict XII to the court of the Khan of Cathay. Starting in 1338 he reached Peking in 1342 and remained there three or four years. He traveled in eastern China; after leaving that country he discovered a church of the Latin communion at Columbum in Malabar in 1348; made a long sea voyage down the coast and probably to Java; and on his return voyage was detained in Ceylon by a native ruler. By 1353 he had returned to Europe and delivered a letter from the Khan to Pope Innocent VI. He became a chaplain of Emperor Charles IV in 1354 and Envoy to the Pope from Florence in 1356. The story of his travels was brought to light by J. G. Meinert in 1820.

MARIGNY, mȧ'rē'nyē', Enguerrand de (1260–1315). A French statesman and financier, born at Lyons-la-Forêt, Normandy. He became grand chamberlain and chief minister of Philip IV the Fair in 1304. He received many favors from Philip and from Edward II of England, but his share in the debasement of the French coinage made him unpopular. When Philip died in 1314, Marigny became a victim of the feudal reaction against the increasing royal power. He was accused of malfeasance in office and of treachery to the King, but his accounts were found to be correct. Louis X, however, permitted him to be convicted on a charge of sorcery, and he was hanged.

MAR'IGOLD (*Mary*, in allusion to the Virgin Mary, *gold*). A name given to certain plants of the family Compositæ, chiefly of the genera *Calendula* and *Tagetes*. The genus *Calendula* comprises about 20 annual and perennial herbs and shrubs, of which some of the former are found in the countries bordering on the Mediterranean, the latter chiefly in South Africa. Pot marigold (*Calendula officinalis*) is a common cultivated annual, native of southern Europe, with an erect stem, 1 to 2 feet high, obovate lower leaves on long stalks, and large, deep-yellow flowers. There are a number of varieties, some of which have double flowers. The whole plant has a slight aromatic odor and a bitter taste. The dried florets are often employed to adulterate saffron and sometimes for coloring butter or cheese. They are also used

in the preparation of soups. The plants are propagated by seeds sown in spring in ordinary garden soil in sunny or half-shady places. Later they are thinned to about one foot apart. The genus *Tagetes* consists of annual and perennial herbs, natives of the warmer parts of America from Arizona to Argentina. Although *Tagetes erecta*, one of those most frequently cultivated, bears the name of African marigold, and *Tagetes patula*, another well-known annual, is called French marigold, both species are Mexican. Corn marigold is *Chrysanthemum segetum*. Marsh marigold (*Caltha palustris*) has no botanical affinity with the true marigolds. *Bidens beckii* is called water marigold.

MARIKINA, mär'ī-kē'nä. See MARMOSET.

MARILLAC, mä'rē'yák', CHARLES DE (1510–60). A French diplomat, born in Auvergne. He became an advocate in Paris; in 1535 went to Constantinople, where he became Ambassador shortly after; and in 1538–43 was Ambassador to Henry VIII of England. From 1547 to 1551 he served in the same capacity in Switzerland and at the court of Emperor Charles V, and in 1555 was one of the negotiators of the Peace of Ardres with England. In recognition of his services he was made Bishop of Vannes in 1550, Archbishop of Vienne in 1557, and a Councilor of State. He played a leading part in the Assembly of Notables at Fontainebleau in 1560, but his policies aroused the enmity of the Guises. He wrote *Discours sur la roupture de la Trefve en l'an 1556* (1556).

MARINA, mä-rē'nä, or MALINTZIN, mä'lĕn-tsēn'. A Mexican woman. She was born in Coatzacoalcos, probably in the early years of the sixteenth century. She was of a noble family, but when a child was sold in slavery to the Tabascan Indians. Soon after Cortés invaded Mexico she became his interpreter and his mistress. She constantly acted as intermediary between the Spanish and the natives, and thus became prominent in all the affairs of the Conquest. Their son, Don Martín Cortés, attained considerable importance in Mexico. She was afterward married to Juan de Jaramillo and was living as late as 1550.

MARINDUQUE, mä'rĕn-dōō'kä. One of the Philippine Islands, situated in the Visayan Sea, 19 miles south of the Isthmus of Tayabas, separating North from South Luzon (Map: Philippine Islands, C 4). It is roughly circular in shape, with a diameter of 24 miles and an area of 667 square miles. Its coast line has four good harbors. Its surface is hilly, with a maximum altitude near the centre of probably 2500 feet. The interior is forested, with some fine grazing grounds. The principal occupations of the inhabitants are cattle raising and the cultivation of rice, coconuts, and hemp. Copra is manufactured and exported. Pop., 1903, 51,674, almost entirely Tagalog. Marinduque was a separate province until June 23, 1902, when the large island of Mindoro (q.v.) was annexed to it; it forms now a subprovince of the Province of Tayabas, Luzon. The capital is Boac (q.v.). Marinduque is a port of call on the main line of communication between Luzon and Mindanao.

MARINE, mä-rēn', MERCHANT, OF THE UNITED STATES. See MERCHANT MARINE OF THE UNITED STATES; UNITED STATES, passim; SUBSIDIES; SHIPBUILDING.

MARINE CITY. A city in St. Clair Co., Mich., 46 miles (direct) northeast of Detroit, on the St. Clair River and on the Rapid Railroad, a freight line (Map: Michigan, G 6). It is a residential city and summer resort. Important industries are the manufacture of salt and beet sugar and the building of wooden vessels for the Great Lakes. The water works are owned by the municipality. Pop., 1910, 3770.

MARINE CORPS (OF., Fr. *marin*, from Lat. *marinus*, pertaining to the sea, from *mare*, sea; connected with Goth. *marei*, AS. *mere*, OHG. *mari*, Ger. *Meer*, Ir. *muir*, OChurch Slav. *morye*, Lith. *máres*, sea; possibly connected with Gk. βρύξ, *bryx*, sea depth). A body of soldiers enlisted for service in the navy. While the marines, as they are called, are by many regarded as a relic of the days when the fighting complement of ships consisted of soldiers, this is not strictly true. Three hundred years ago, when the heavy gun displaced the ram as the principal naval weapon of offense, the soldiers on board ship rapidly decreased in numbers and importance and soon disappeared from the ships altogether. After a few years' absence they were brought back again. In 1653 Admiral Blake embarked a number on his ships to act as riflemen in his action against Van Tromp. Their efficiency probably led to the establishment of the British marine corps in 1664, but afterward it was several times wholly or partly abolished.

The value of well-trained and expert riflemen in the close-fought actions and frequent hand-to-hand encounters of the seventeenth, eighteenth, and nineteenth centuries was so great as to cause marines to form important parts of the complements of all men-of-war of those days. They were, moreover, of much use as a police force for controlling the mixed, ignorant, and often mutinous sailors who composed the crews in the days of the press gang and indiscriminate enlistment.

The United States marine corps was established by Act of Congress dated June 25, 1776, and provided for the appointment of one major (Samuel Nichols), nine captains, and ten first lieutenants. After the close of the Revolution the navy was practically abolished, and, with the other branches of the service, the marine corps disappeared. When the reorganization of the navy took place in 1798, the marine corps was again established with an authorized strength of 881 officers and men commanded by a major.

During the first 75 years of the nineteenth century the marine corps was one of the most important and distinguished parts of the navy, both afloat and ashore. Its officers and men added lustre to their name in the naval operations on the Barbary coast, in the War of 1812, and in the Civil War. But with the advent of the high-power gun the battle range increased to such an extent that riflemen were no longer of use in naval action, and the removal of marines from ships began to be urged. The arguments to this end were given added force by the fact that marines were no longer needed for shipboard police on account of the greatly improved character of the enlisted force of the navy. The removal might have taken place but for the contemporary total abolition of sails on fighting ships, which obviated the necessity for a ship's company composed wholly of sailors of the old type. It was therefore possible to find a place for a limited number of well-trained riflemen who could be utilized at the smaller guns. Then came the Spanish War and furnished its lesson as to the value of a military expeditionary force

to accompany the fleet, not only wholly under naval control, but thoroughly conversant with the practical needs of the vessels and of the service generally. The marine corps, therefore, shared in the general naval expansion which followed the war and has continued to increase as the navy has developed.

At present marines form about 10 per cent of the complements of large ships in the United States navy and are found most useful in landing operations for the protection of American citizens and their property in regions disturbed by war or insurrection. The sailors are drilled as infantry and artillery, but as their chief duties are connected with the main battery of the ship, when they are landed the battle organization of the vessel is entirely broken up, so that they cannot be spared without greatly weakening the efficiency of the ship.

Less than one-third the marine corps is on shipboard. The remainder is distributed in barracks in or near the principal naval stations. During the prevalence of ordinary conditions they act as guards and military police forces at these stations, but they are organized and trained as regiments or parts of regiments and are ready for mobilizing at any time as an expeditionary force of one to six regiments (two are usually in the Philippines) for immediate service wherever American interests are threatened by revolutionary disturbances abroad; or, in case of war, to be sent to seize certain foreign places, to establish a fortified advance base, or to protect weak or threatened points. They are carried in naval transports, conveyed by fighting ships, and accompanied by freight and supply ships if advance base and other materials are needed in quantities to make this necessary.

The commandant of the corps is a major general. The staff consisted (1915) of one adjutant and inspector, one quartermaster, and one paymaster, all with the rank of colonel. As assistants in these staff departments there are: 5 lieutenant colonels, 8 majors, and 13 captains. The line consists of 8 colonels, 7 lieutenant colonels, 8 majors, 94 captains, 97 first lieutenants, 89 second lieutenants, and 9921 noncommissioned officers and privates. Consult: J. F. Cooper, *History of the Navy* (New York, 1866); R. S. Collum, *The History of the Marine Corps* (ib., 1902); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. ii (ib., 1914); also the works of Maclay, Spears, and other naval historians.

Marine Corps in Foreign Navies. France, Austria, Spain, Japan, and Greece have no marines. Argentina, Brazil, Italy, Germany, and the Netherlands have marine infantry. Chile has marine infantry and artillery. Denmark has marine artillery. Russia has marine infantry and artillery in large numbers. Most of the troops of these countries are used at naval stations and in the colonies; few are used on board ship except in the Russian navy. The British marine corps is very similar to the American, except that it is divided into marine infantry and marine artillery. It was established in 1664 and was at first called the Admiral's Regiment. At this time the irregular methods of obtaining crews for men-of-war and the lack of regulation of the naval forces made the presence of such a disciplined force necessary. Impressment and the dissatisfaction engendered by the various methods of forced service continued the necessity for nearly 200 years. While no longer required for their original purpose, they still form a valuable part of the British navy. The budget for 1914–15 provided for 428 commissioned officers, 85 warrant officers, 1353 staff sergeants and sergeants, 1801 band ranks, buglers, and music, 227 band boys, and 14,691 rank and file.

MARINED, má-rēnd′. A term in heraldry, applied to an animal whose lower extremity terminates in a tail like that of a fish. See HERALDRY.

MARINE DISASTERS. See SAFETY AT SEA.

MARINE ELEVATOR. See GRAIN ELEVATOR.

MARINE ENGINEERING. That branch of the science and art of engineering which concerns itself with the propulsion of ships and the design and operation of ship machinery of all kinds. At one time it was solely concerned with steam engineering, but such is no longer the case, for ships not only have auxiliary machinery driven by electric power or internal-combustion engines, but many ships are propelled by them. The different parts of the subject are considered or treated under the heads of BOILER; DYNAMO-ELECTRIC MACHINERY; INTERNAL-COMBUSTION ENGINE; SCREW PROPELLER; SHIP; SHIPBUILDING; SHIPPING; STEAM ENGINE.

MARINE GLUE. See CEMENT; GLUE.

MARINE HOSPITAL SERVICE. See PUBLIC HEALTH SERVICE.

MARINE INSURANCE. The practice of marine insurance, at least on a purely commercial basis, antedates by centuries the application of the insurance principle to other kinds of risks. Even in ancient times there was developed a system of quasi-insurance in the form of loans on bottomry by which risks were at least partially transferred. In the Middle Ages marine insurance on a commercial basis first appeared as early as the thirteenth century in Flanders and in Portugal. The oldest legal document relating to insurance which has come down to us consists of the ordinances issued by the magistrates of Barcelona in 1435 to regulate the business of marine insurance. Marine underwriting appears to have been introduced into England by the Lombards early in the sixteenth century. By the eighteenth century that country had obtained the leading position in the business, which she has since maintained.

For many years marine underwriting in England was carried on exclusively by unassociated individuals and continued to be conducted on a strictly individual basis until late in the eighteenth century. The first step towards the regulation of marine underwriting by the Lloyds Association (see LLOYDS) was taken in 1779, when a printed form of policy was adopted, practically the same as the one still in use. In 1871 the Lloyds Association was incorporated by Act of Parliament, the articles of incorporation stating as the main objects of the organization the conduct of the business of marine insurance, the protection of the interests of the members of the association, and the collection and publication of information in regard to shipping. It is for the accomplishment of the last-named purpose that the association has developed its remarkable system of agencies, whose intelligence and dispatch in gathering and reporting shipping news are unequaled in any similar organization. Marine underwriting at Lloyds is still exclusively an individual transaction, though under the general supervision of the association. The

method of transacting business is as follows: A merchant having a ship to insure sends through a broker a slip setting forth the characteristics of the risk he desires insured. Any underwriter who desires to assume a part of the risk places on the slip his initials and the amount he is willing to assume. No one underwriter assumes very large risks, a ship and cargo being usually underwritten by a large number of individuals, each of whom carries from £100 to £500. The responsibility of each underwriter is limited to the amount for which he has subscribed. When the entire amount has been subscribed, the policy is made out and signed by those who have already put their initials on the slip.

In the seventeenth century two insurance companies, the Royal Exchange and the London, were authorized to transact a marine business, while the privilege was denied to all other companies. These two companies appear to have done little marine underwriting. In 1824 the monopoly restriction was removed, and since that time many companies have gone into the business. Even these companies, however, find it advantageous to work through Lloyds, each of them having a representative on the floor of that association.

In America marine insurance was the first form to be written. In 1759 the first office was established, although a large amount of individual underwriting had previously been carried on. This office was opened in New York and was known as the Old Insurance Office. The method of conducting business was by individual underwriting, after the manner of the English Lloyds.

It was not until near the end of the eighteenth century that corporations took up the business of marine underwriting. The first in the field were the Insurance Company of North America and the Insurance Company of the State of Pennsylvania. Both were located in Philadelphia, and both began marine underwriting in 1794. The growth of the business was rapid and was greatly stimulated by the expansion of American shipping during the period of the Napoleonic wars in Europe. The companies rapidly absorbed the entire business of the country, and by the year 1825 individual underwriting was practically at an end in the United States.

The period of the Civil War subjected the marine companies to a severe strain, and several of them succumbed. Since that time the condition of marine underwriting has reflected the condition of the shipping industry of the country. The great growth of the business has been seen, not in the insurance of risks on the high seas, but in the insurance of risks on inland waters. The headquarters for the insurance of shipping on the lakes is Chicago. The business is especially hazardous on account of the limited area over which the operations extend and a consequent great fluctuation in loss rate.

Upon the outbreak of the European War in 1914 the difficulties encountered by American shipping led to the passage by Congress of an Act to establish a bureau of war risks in the Treasury Department. The Act was signed by the President on Aug. 19, 1914, and went into effect immediately. The Secretary of the Treasury was authorized to appoint a director and other officers of the bureau and to aid the bureau in fixing premiums and in adjusting payments for losses. The function of the bureau was to insure American ships and cargoes therein against loss or damage by risk of war whenever it appeared to the Secretary impossible for American shippers to secure war-risk insurance on terms substantially equal to those given foreign vessels or cargoes by their respective governments. An appropriation of $5,000,000 was made to inaugurate the system, in addition to $100,000 to defray the expenses of the bureau. The President was authorized to suspend the operation of the Act as soon as the necessity of war-risk insurance should disappear. In any event the Act was limited to two years from the date of enactment.

The general principles on which marine insurance is based are not different from those underlying other forms of insurance, but in practice the former presents a number of peculiar features.

The Policy. The common form of marine policy is the voyage policy, i.e., a policy to be in force for a voyage from one specified port to another. Occasionally, however, a ship is insured under a time policy, which is to be in force for a specified time, usually a year. The chief practical distinction between the two is that with a voyage policy there is always a warranty, express or implied, that the ship is seaworthy at the beginning of the voyage, while with a time policy no such warranty is implied.

An open policy is one which provides that in case of total loss the amount of the indemnity shall be determined by ascertaining the amount of loss actually suffered. It is incumbent upon the insured to prove the value of the destroyed property. A valued policy, on the other hand, provides that in case of total loss the amount stated in the policy shall be regarded as the value of the insured property and paid as indemnity. Valued policies are more frequently issued on the ship, while the cargo is more commonly covered by an open policy. The use of the valued policy has undoubtedly tended to increase the amount of overinsurance and deliberate destruction of vessels. This practice is especially easy under the system of individual underwriting prevailing at Lloyds, since the underwriter frequently knows little or nothing about the ship he is insuring beyond what is stated in the slip.

Objects. The objects most commonly insured under a marine policy are ship, cargo, and freights. Sometimes other objects are covered, such as the expected profits of the voyage or, more frequently, the liability for damages on account of collision. The insurance of freight is an illustration of a peculiar feature of marine insurance. In all other forms of insurance of property the amount of indemnity that can be recovered in case of loss is determined by the value of the property destroyed, *damnum emergens*. In marine insurance it is possible to insure an expected gain and to obtain indemnity if the occurrence of any of the events covered by the policy makes it impossible to realize the gain, *lucrum cessans*.

Dangers. A marine policy covers a far greater number and variety of dangers than any other form of policy issued. Besides the more characteristic perils of the seas, such as wind and wave, fire, collision, stranding, jettison, and the like, the policy covers three distinct kinds of danger—war risks, including detention as well as capture or destruction; pirates, rovers, and thieves; and barratry, or illegal acts of captain

or crew. As to the losses caused by the perils of the sea, they must be due to extraordinary action of wind and wave or to some other unusual cause. The losses caused by ordinary forces are known as wear and tear and are not covered by the insurance. The distinction between the two kinds of losses has been the subject of much litigation, and the present condition of the law of the subject is precise but complex. Modern policies cover some further kinds of loss, especially liability for damages on account of collision.

Insurance after the Loss. Uncertainty as to the fate of a vessel may continue for an indefinite time after the loss has occurred. Insurance may be taken out on an overdue ship, and even though it should afterward appear that the vessel had already suffered shipwreck at the time when the insurance was effected, the indemnity could still be collected. The premium rate on an overdue ship indicates the judgment of the underwriters as to the probability that the vessel has already suffered disaster.

Reinsurance. Individual underwriters enjoy only to a limited extent the advantages that come from the combination of a large number of risks in a group, and consequently single losses may involve a considerable share of their capital. They avoid this danger partly by underwriting only a small portion of the value of each ship they insure and partly by resorting to reinsurance. As it is always possible to insure a ship so long as it is unknown whether she suffered disaster or not, it is customary for those who have insurance in force on a vessel that is overdue to protect themselves by reinsuring her. They are naturally obliged to pay higher premiums than they themselves received. If this process of reinsurance is repeated several times, as is frequently the case, the effect is that a loss is distributed in small proportions over a large number of underwriters.

The Loss. Loss may be complete or partial. When it is complete the settlement between the insured and the underwriters is comparatively simple. On a valued policy an insurer becomes liable for the amount stated in the face of the policy. In the case of an open policy it is necessary for the insured to prove the value of the property destroyed or the amount of freight lost. Unless otherwise agreed, the value of the ship is its value at the time of starting on the voyage with the value of the ship's stores included; the value of the cargo is its invoice value with the addition of insurance premium and other charges; and the value of the freight is the amount the ship would have earned if she had reached her destination in safety.

Abandonment. A peculiar feature of marine insurance is the practice of abandonment, when the insured surrenders or abandons to the underwriters the property covered by the policy and demands his entire indemnity. This right does not always exist, but arises only when the insured property has suffered so serious damage from perils covered by the policy that it amounts to constructive total loss. With regard to the ship or the cargo there is held to be constructive total loss when the damage exceeds one-half the value of the vessel or cargo respectively and when the vessel is captured by the enemy or detained by embargo. There is constructive total loss of cargo when it is so badly injured that it has to be sold at some other place than its original destination. There is constructive loss of freight when the ship is unable to complete her voyage, or the goods on which the freight is to be paid are so badly damaged that they cannot be carried to their original destination.

When the conditions are such as to give a legal right to abandon, it is optional with the insured whether he will take advantage of the right or not. If he decides to do so he must give notice to the insurer within a reasonable time; and having once elected to abandon, it is impossible for him to draw back. The effect of abandonment is to vest the title to the insured property in the underwriter and to convey to him all rights and claims on account of the ship and cargo.

Average. When there is partial loss and the insured cannot or does not elect to abandon and receive the entire indemnity, it becomes necessary to ascertain the amount for which the insurer is liable. Such partial losses are known by the name of "average," a term borrowed by marine insurance from general maritime law. It is frequently necessary to sacrifice some part of the ship or cargo in order to save the rest. It is obviously unjust to have the entire burden of loss under such circumstances fall upon the party whose property is thus voluntarily destroyed or injured. Maritime law, therefore, prescribes the way in which such losses shall be apportioned or averaged among all the interests at stake. The term "average" was later extended to include losses of all kinds. To distinguish those losses which are of such a nature that they ought to be apportioned among all the parties from those which ought to be borne entirely by the party whose property is damaged, the former kind of loss is called general average, the latter particular average. In the case of the ship, the voluntary cutting away of a mast to save the ship would be general average; the loss of a mast through the violence of the wind would be particular average. There is general average on the cargo when a part of it is jettisoned or thrown overboard to lighten the ship; there is particular average when a part of it is damaged as the result of the action of forces which are included in the policy. So far as the insurance is concerned, it is the general rule that the insurer is liable for all general averages under all conditions, in the absence of fraud. His liability for particular average, however, is usually limited in the policy. For certain kinds of commodities the policy exempts the insurer from all liability; for others, from liability for losses of less than 5 per cent or some other specified proportion, unless the ship be stranded; while for all other commodities and for ship and freight, liability does not attach unless the loss exceed 3 per cent or the ship be stranded. When several successive losses are experienced during the same voyage, the sum of all the losses is the amount considered in determining whether the percentage of loss is high enough to render the underwriters liable.

The measure of the liability of the insurer for particular average on the ship is the cost of repairs, including all extra expenses which they involve, with a deduction, usually of one-third, from the value of new material used in repairing the ship; in the case of freight it is the amount actually lost through the diminution in the weight of the cargo; and for the cargo it is that part of the invoice value of the damaged goods which remains after there has been subtracted from their total value such a proportion

of the total value as the gross value of the damaged goods at the port of destination is of the gross value of similar goods in a sound condition.

General Average. In the absence of insurance general average would be apportioned among all the owners of ship, cargo, and freight. Each party, including the one whose property was sacrificed, would make contribution in proportion to the value of the property he had at stake. In estimating that value the value of ship and cargo is usually taken at their actual value when they reach their destination, while the value of the freight is ascertained by subtracting the wages of captain and crew from the gross amount received as freight. When the different parties are insured, general average is paid by the underwriters and not by the owners of the property. So far as general average is concerned, insurance is a transfer from owners to underwriters of liability for contributions to reimburse those whose property has been sacrificed for the general good.

Sue and Labor. When loss or disaster threatens a ship or cargo, the master of the vessel is bound to do everything in his power to avoid the danger or avert the loss. Whatever expense is incurred for that purpose the underwriters are responsible for, under the so-called suing and laboring clause, which reads as follows: "In case of any loss or misfortune, it shall be lawful to the assured, their factors, servants, and assigns, to sue, labor, and travel for, in, or about the defense, safeguard, and recovery of the said goods and merchandise, or ship, or any part thereof, without prejudice to this insurance: to the charges whereof, we, the assurers, will contribute, each one according to the rate and quantity of the sum herein insured." While the clause says that the insured "may" so sue and labor, it is the established rule of law that he is bound so to act. The general rule is that, in case of damage or partial loss, the insured is bound to act as a prudent man would act under the circumstances if he were uninsured.

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MARINE LABORATORY. See LABORATORY.

MARINE METEOROLOGY. See METEOROLOGY.

MARINE RAM. See RAM, MARINE.

MAR'INER'S COMPASS. See COMPASS.

MARINE SAFETY. See SAFETY AT SEA.

MARINE SURVEYING. See HYDROGRAPHY.

MARINETTE, măr'ĭ-nĕt'. A city and the county seat of Marinette Co., Wis., 178 miles north of Milwaukee, on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Wisconsin and Michigan railroads (Map: Wisconsin, F 3). It is situated at the mouth of the Menominee River, on Green Bay, opposite Menominee, Mich., with which it is connected by bridges and by steam and electric trams. Marinette has a fine harbor and carries on an extensive lake commerce, and its good water power and proximity to valuable forests have developed its extensive lumber interests. It is, moreover, growing in favor as a summer resort. There are also large box factories, knitting mills, granite works, several establishments making various cedar products, pail and broom factories, paper and pulp mills, ironworks, and manufactories of steam threshing machines, gloves, cutlery, pianos, cooperage supplies, and gas and traction engines. Settled about 1850, Marinette was incorporated in 1887. The government is administered under a general charter of 1898, which provides for a mayor, elected every two years, and a unicameral council. Pop., 1900, 16,195; 1910, 14,610; 1920, 13,610.

MARINETTI, mär'ē-nĕt'tē, FRANÇOIS (1878–). A poet, born at Alexandria, Italy, but a resident of France. He founded and directed the international review, *Poesia*, and initiated and became the advocate of a literature of "futurism." Among his works are: *Le roi Bombance* (1905), satirical tragedy; *La conquête des étoiles* (1902; 2d ed., 1908); *La ville charnelle* and *Les dieux s' en vont, d' Annunzio reste* (1908); *Poupées électriques* (1909), a drama; *Mafarka-le-futuriste* (1910); *Le futurisme* (1911), the manifesto of his school; *La bataille de Tripoli* (1912); *Le monoplan du pape* (1914).

MARINI, mä-rē'nē, GIAMBATTISTA (1569–1625). An Italian poet, born at Naples, Oct. 18, 1569, frequently called simply Cavalier Marino. He began the study of jurisprudence, but lived so wildly that his father eventually banished him from home. He was received by the chief admiral of Naples as secretary, but the part he played in connection with an abduction forced him to flee to Rome. There he prospered, and before long (1603) he was able to undertake a journey to Venice to superintend the publication of his verse. Attached to the household of Cardinal Aldobrandini, he traveled with him in Italy and, under his auspices, came into contact with many men of letters of the time. He next won the favor of the ducal ruler of Turin, Charles Emmanuel I, but, as a result of one of his many quarrels growing out of literary jealousies, he was arrested, and upon his release went to Paris, where he won the good graces of Maria de' Medici. He remained in France from 1615 to 1623, and then, returning to Italy, he was everywhere received with extraordinary honor. He died at Naples, March 25, 1625. Before his twentieth year Marini had gained considerable repute by his *Canzone de' baci*. The first collection of his verse was that of Venice (1602–14), entitled *La lira*, in which there is an erudite imitation of Ovid, Tibullus, Spanish writers, and earlier Italian poets. Not to mention his *Sampogna*, his *Strage degl' innocenti*, his *Gallerie* and minor lyrics, his most noted production is the *Adone* (Venice, 1623), a long poem in octaves, ostensibly on the love of Venus and Adonis, but containing long digressions. What most attracts modern attention in this work is its mannerisms, the excess of imagery, and its overwrought style; with its contemporaries it aroused unbounded admiration, as well as bitter criticism among Marino's enemies. Of these the most venomous was

Tommaso Stigliani, whose *Occhiale* initiated a polemic lasting over half a century. The *Adone* is the most brilliant and most characteristic specimen of the concettistic literature of the Italian seventeenth century. As regards form, it shows the extreme development of the Renaissance theory of ornament as the essence of style; as regards substance, it reflects the sensualistic æstheticism of its time with a genius somewhat similar to that of our contemporary D' Annunzio.

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MARIN INDIANS. See MIWOK STOCK.

MARINO FALIERO, mȧ-rē′nō fȧ-lyā′rō. A drama by Byron (1820).

MARINONI, mä′rē-nō′nē, HIPPOLYTE (1823–1904). A French inventor, born at Paris. He invented a rotary press which could print 40,000 impressions in an hour and was extensively used, and another which printed polychromes in six colors at the rate of 20,000 an hour, as well as many other improvements in printing. After 1883 he was editor of the *Petit Journal.*

MARIO, mä′rē-ō, GIUSEPPE, MARQUIS DI CANDIA (1810–83). An Italian dramatic tenor singer, born at Cagliari, Sardinia. In 1830 he received his commission as officer in the chasseurs Sardes, but abandoned his commission and fled to Paris, where he later secured the appointment of first tenor at the opera. At the same time he adopted the name Mario. After two years' study at the Conservatory he made his début in 1838 in *Robert le Diable* and achieved the first of a long series of operatic triumphs. From 1845 to 1850 he fulfilled an engagement in Russia and on his return appeared in London, and in 1854 he went to America. In his private life he was known for generosity to struggling artists. His repertoire embraced all the staged operas of Rossini, Bellini, Donizetti, and Verdi. In 1844 he married the singer Grisi. He died in Rome. Consult Judith Gautier, *Le roman d'un grand chanteur* (Paris, 1912).

MARION, măr′ĭ-on *or* mȧr′-. A town and the county seat of Perry Co., Ala., 28 miles northwest of Selma, on the Southern Railway (Map: Alabama, B 3). It has the Judson Female Institute (Baptist), opened in 1839; Marion Female Seminary, opened in 1836; Marion Military Institute; the Lincoln Normal School for colored pupils (Congregational); and a Carnegie library. An agricultural country surrounds the town. There are municipally owned water works. Pop., 1900, 1698; 1910, 1834.

MARION. A city and the county seat of Williamson Co., Ill., 114 miles southeast of St. Louis, Mo., on the Illinois Central, the Chicago and Eastern Illinois, the St. Louis, Iron Mountain, and Southern, and the Eldorado, Marion, and Southwestern railroads (Map: Illinois, G 10). It has a trade in grain and live stock, and manufactures of flour, cigars, canvas gloves, shoe machinery, novelties, etc. In the vicinity are fine timber lands and deposits of coal, the mining of which constitutes the leading industry. Pop., 1900, 2510; 1910, 7093.

MARION. A city and the county seat of Grant Co., Ind., on the Mississinewa River, 68 miles (direct) northeast of Indianapolis, on the Cleveland, Cincinnati, Chicago, and St. Louis, the Pittsburgh, Cincinnati, Chicago, and St. Louis, the Toledo, St. Louis, and Western, and the Chesapeake and Ohio of Indiana railroads (Map: Indiana, F 3). Interurban electric lines connect the city with Indianapolis and other cities and towns. Marion has a Federal building, fine courthouse, a large normal college, hospital, and Carnegie library. A National Soldiers Home, which cost $1,500,000, is 3 miles to the south. The city is the centre of a farming region and has a supply of natural gas. There are extensive manufactories of glass products; also flouring, saw and planing, linseed-oil, and pulp and paper mills; foundries, cornice and brick works; and manufactories of bedsteads, motor trucks, railway supplies, furniture, cement posts and blocks, forgings, engines and boilers, paper-mill machinery, shoes, and gasoline motors. The government is vested in a mayor, elected every four years, and a unicameral council. Marion owns and operates its water works. Pop., 1900, 17,337; 1910, 19,359; 1914 (U. S. est.), 19,656; 1920, 23,747.

MARION. A city and the county seat of Linn Co., Iowa, 5 miles northeast of Cedar Rapids, at the junction of divisions of the Chicago, Milwaukee, and St. Paul Railroad (Map: Iowa, F 2). It is situated in a fertile agricultural country, is a healthful residential city, and has the county buildings, a Carnegie library, sulphur springs, a park in the centre of the city, and a septic sewer system. There are large freight yards and repair shops of the Chicago, Milwaukee, and St. Paul Railroad; also a flouring mill, a broom factory, cement block and vault works, and two greenhouses. Marion was settled in 1839 and was incorporated in 1852. Pop., 1900, 4102; 1910, 4400.

MARION. A city and the county seat of Marion Co., Ohio, 46 miles north of Columbus, on the Hocking Valley, the Cleveland, Cincinnati, Chicago, and St. Louis, the Pennsylvania, and the Erie railroads (Map: Ohio, D 4). There are division headquarters of the Erie Railroad, a Carnegie library, a normal school, the Marion County Children's Home, Old Ladies Home, Elks Home, and a fine Federal building. Marion is the centre of a farming district and has lime works, malleable iron works, silk mills, a piano factory, and manufactories of engines, steam shovels, dredges, shoes, agricultural machines, racing sulkies, etc. Pop., 1900, 11,862; 1910, 18,232; 1914 (U. S. est.), 22,032; 1920, 27,891.

MARION. A city and the county seat of Marion Co., S. C., 103 miles east of Columbia, on the Atlantic Coast and the Raleigh and Charleston railroads (Map: South Carolina, E 2). It is in a fertile region interested chiefly in cotton and tobacco growing and has cotton and cottonseed-oil mills, a foundry, large lumber mills, etc. There is a Carnegie library and a well-kept city park. Pop., 1900, 1831; 1910, 3844.

MARION. A city and the county seat of Smyth Co., Va., 107 miles west by south of Roanoke, on the Norfolk and Western Railroad, at the terminus of the Marion and Rye Valley Railway (Map: Virginia, C 5). It is the seat of the Southwestern State Hospital for the Insane, accommodating about 700 inmates, and of the Marion Female College (Lutheran). The principal industries are woodworking, milling, mining, and stone quarrying. Settled in 1832, Marion was first incorporated in 1871. The

town has its own water supply, obtained by the gravity system from springs which are about 3 miles distant. Pop., 1900, 2045; 1910, 2727.

MARION, Francis (1732–95). An American soldier. He was born at Winyah, near Georgetown, S. C., in which neighborhood his grandfather, a Huguenot refugee, had settled soon after the revocation of the Edict of Nantes in 1685. In 1759 he removed to Pond Bluff, near Eutaw. In 1775 he represented St. John's Parish, Berkeley County, in the Provincial Congress, which adopted the Bill of Rights, and voted to raise forces after the battle of Lexington. He was commissioned a captain in Colonel Moultrie's regiment June 21 and took part in the occupation of Fort Johnson, which caused the flight of the royal Governor, Lord William Campbell. After his promotion to major, in 1776, he was stationed at the unfinished Fort Sullivan (afterward called Fort Moultrie), in Charleston harbor. He showed great coolness during Sir Peter Parker's bombardment, June 28, 1776, and was made lieutenant colonel in the regular service. For a time he was in command of Fort Moultrie, and then took part in the unsuccessful attack of D'Estaing and Lincoln on Savannah in 1779. When the British captured Charleston in 1780 and began to overrun the State, Marion fled to North Carolina, where he met General Gates, who received him coldly. Soon he was asked to command four companies of irregular cavalry, which had been raised around Williamsburg, S. C., and in August, 1780, Governor Rutledge gave him a commission as brigadier general of State troops. His irregular force was ill-equipped and ill-fed, yet Marion demonstrated himself the greatest of partisan leaders, in spite of many obstacles and disadvantages. After the defeat of Gates at Camden and of Sumter at Fishing Creek, this was for a time the only American force of any strength in the State. The men furnished their own equipment and came and went almost at will, as it was necessary to protect their families from the Tories and to plant their crops.

The first important action was on Aug. 2, 1780, at Nelson's Ferry, where two companies of British regulars were routed and 150 Continental soldiers taken at Camden were recaptured. Marion's men caused much trouble to Cornwallis by intercepting communications, capturing foraging and scouting parties, and intimidating the Tories. Major Wemyss and Colonel Tarleton were especially instructed to take him. For a time Marion was forced to retreat towards North Carolina, but in 1781 he established himself at the confluence of Lynch's Creek and the Pedee River, in a swampy forest known as Snow's Island. He took Fort Watson in conjunction with Col. Henry Lee, captured Fort Motte and Georgetown, fought at Quinby's Bridge and Parker's Ferry and at Eutaw Springs. The force was not disbanded until after the British evacuation, in December, 1782. In June, 1782, Marion put down a Loyalist uprising on the banks of the Pedee River, and in August he left his brigade and returned to his plantation. Marion was elected to the General Assembly in 1782 and was publicly thanked by that body in 1783. As he had been impoverished by the war, the sinecure of commandant of Fort Johnson was created for him with a salary of £500 per annum. After his marriage to a wealthy woman, Mary Videau, he represented St. John's in the State Senate and in the Constitutional Convention of 1790. Consult: Sir Banestra Tarleton, *History of the Campaigns of 1780–1781 in the Southern Provinces of North America* (Dublin, 1787); Horry and Weems, *Life of General Francis Marion* (Philadelphia, 1852); W. G. Simms, *Life of Francis Marion* (ib., 1860); Edward McCrady, *History of South Carolina in the Revolution* (New York, 1901–02); and a "Study of Marion's Ancestry and Early Life," in *Southern and Western Monthly Magazine and Review*, vols. i, ii (Charleston, 1845).

MARION DELORME, mȧ'rē-ōn' de-lôrm'. A drama by Victor Hugo (1831), based on the life of the notorious courtesan of that name. She appears in De Vigny's *Cinq-Mars* and in Bulwer's *Richelieu*.

MARIONETTE, măr'ĭ-ō-nĕt' (from It. *morio*, a fool or buffoon, or possibly from *mariolette*, meaning a diminutive figure of the Virgin Mary). A small, jointed figure, representing a character in the miniature drama of a puppet theatre. See Puppet.

MARIOTTE, mȧ'rē-ŏt', Edme (c.1620–84). A distinguished French natural philosopher. He was born in Burgundy and was the prior of St. Martin-sous-Beaune, near Dijon. He was active in developing experimental research in France and was one of the first members of the Académie des Sciences, founded in 1666. He repeated Pascal's experiments on gravitation and detected some peculiarities which had escaped that philosopher; confirmed Galileo's theory of motion; discovered through experiment an approximate formula for determining heights by the barometer; enriched hydraulics with a multitude of discoveries; and finally made a thorough investigation into the subject of the conduction of water and calculated the strength necessary for pipes under different circumstances. His collected works were published at Leyden in 1717 and at The Hague (2 vols., 4to) in 1740. His *Traité du mouvement des eaux* was published at Paris in 1686. Mariotte's name is associated with the law of gases discovered 14 years previously by Robert Boyle, this law being always known in France as Mariotte's law. It was published in a treatise, *Sur la nature de l'air* (1676). It is, in substance, that the volume of a gas varies inversely as the pressure it is under.

MARIOTTE'S LAW, usually referred to as the law of Boyle and Mariotte. See Boyle's Law; Gases, General Properties of.

MAR'IPO'SA (Sp., butterfly). A local name in California for the opah (q.v.).

MARIPOSA GROVE. A tract of land 4 square miles in extent in Mariposa Co., Cal., containing two groves of the *Sequoia gigantea*, consisting of about 465 fine specimens. The largest of the trees, the Grizzly Giant, has a circumference of 94 feet, and its main limb, at a height of 200 feet, is 6½ feet in diameter. The road between the groves passes through an opening 9½ feet wide, cut through the heart of one of the trees. The tallest tree is 272 feet high, and a number exceed 250 feet. The tract is reserved as a State park.

MARIPOSA LILY. See Calochortus; Liliaceæ and Plate.

MAR'IPO'SAN, or Yokut. A linguistic stock or family of North American Indians, formerly located in southern California, about Tulare Lake, and extending as far north as the junction of the Fresno with the San Joaquin.

Twenty-four subtribes are mentioned by Powell. Of these there survive: Choinimni, Chookiminah, Chukchansi, Kashowoo, Tachi, Wechikht, Wikchamni, Yokuts, and Yowdanchi, 533 individuals in all. Every village consisted of a single row of wedge-shaped huts of tule, with an awning of brush stretched along the front. These houses were used for sleeping purposes only. The mountainous condition of the country was naturally productive of a series of isolated areas, in which each camp with its separate captain and medicine man resided. The main sources of their food supply were fishing, hunting, and gathering acorns. Their weapons were sinew-backed bows and excellent arrows. There are no more delicate and beautiful baskets made anywhere than in the villages of this stock, and specimens are to be seen in every fine collection, together with fish weirs, fishing booths, fish traps, and tule boats. Consult Stephen Powers, *Contributions to North American Ethnology*, vol. iii (Washington, 1877), and J. W. Powell, *Seventh Annual Report of the Bureau of Ethnology* (ib., 1891).

MARIQUINA, mä′rē-kē′nä. A town of Luzon, Philippines, in the Province of Rizal. It is situated 7 miles northeast of Manila, at the intersection of several important roads, and has manufactures of shoes and other leather work. In the neighborhood are the medicinal iron springs of Chorillo. Pop., 1903, 8187.

MARIS, mä′rīs. The brothers JACOB, MATTHIJS, and WILLEM, three of the most distinguished among modern Dutch painters. JACOB (1837–99), the eldest, was born at The Hague, studied under Stroebel, Van Hooc, and at the Antwerp Academy, also for a short time under Hébert in Paris. After his return from France he lived chiefly at The Hague. His art is essentially Dutch, owing most to Vermeer and Rembrandt; it is purely pictorial, powerful yet graceful. The color is soft, lucid, and delicately harmonious. His subjects are usually views of Dutch cities, canals, windmills, and the seashore. Twenty-four pictures by him, including the admirable "View of a Dutch Town" and "The Shell Gatherers," are in the Rijks Museum, Amsterdam. There is also a beautiful "View of a Village" in the Dordrecht Museum. Other fine landscapes are "The Bridge" (Frick collection, New York) and "Canal in Holland" (Metropolitan Museum, New York). Good examples of his figure paintings are the "Young Mother" (Rijks Museum) and "The Bird Cage."

His younger brother, MATTHIJS (Matthew) (1839–), was also born at The Hague, studied there at the Academy under Louis Meijer and at the Antwerp Academy. He followed his brother to Paris in 1869, but after 1872 lived chiefly in London. Possessed of a romantic imagination strongly tinged with mysticism, he lived the life of a recluse, painting in a vague, mysterious, yet intensely personal manner. His art is characterized by purity of line and charm of color. His type of woman is unique—monumental yet childlike, mysterious yet intensely living. Among his most celebrated paintings are "The Bride" and the "Cake Baker," both in the Mesdag collection, The Hague; "Butterflies"; "Primavera"; "Siska"; "In the Slums"; and "Revery" (Metropolitan Museum, New York). His landscapes include "Souvenir of Amsterdam," "The Four Windmills," and "Lausanne." His etchings and drawings are no less individual and charming than his paintings.

WILLEM (1844–1910) was almost equally as distinguished in landscape and cattle painting as his elder brothers, under whom he studied. His work is brighter and warmer in color but less virile and varied than Jacob's. He delights in gray-green tones, rich landscapes with sunlight effects. His subjects are usually landscapes with gleaming water, in which are cows or ducks, although he sometimes paints pure landscapes. The collection of James G. Shepard, in New York, possesses five of such paintings; the Rijks Museum, Amsterdam, six. The Shepard collection also possesses a like number of paintings by each of his brothers. Consult: Eduard Rooses, *Dutch Painters of the Nineteenth Century*, vols. ii and iv (London, 1898–1901); D. C. Thomson, *The Brothers Maris* (New York, 1907); Marius, *Dutch Painting of the Nineteenth Century*, English translation (London, 1908).

MARISMAS DEL GUADALQUIVIR, mä-rēs′mäs dĕl gwä′dȧl-kē-vēr′, MARQUÉS DE LAS. See AGUADO, ALEJANDRO MARÍA.

MARISTS, mā′rīsts, and **MARIANISTS**, mā′rī-an-ists (Neo-Lat. *Marista*, from Lat. *Maria*, Mary). The Society of Marists was founded by the venerable Jean Claude Marie Colin (born 1790 and died 1875), who obtained canonical approbation for his society from Gregory XVI in 1836 and was Superior General from 1836 to 1854. Many missionary houses and colleges were established in France and all Oceanica was put under the care of the fathers. A province was erected in the United States in 1889, where they have, according to the official Catholic Directory of 1915, 123 priests, 36 scholastics and novices, 50 aspirants, 21 parishes, and 4 colleges. The *Marianists*, a distinct community, was begun in 1817 in France by William Joseph Chaminade, born in 1761. His society was approved by Leo XIII in 1891. The order has increased rapidly and expanded widely. They are to be found in Belgium and in many other European countries, as well as in China, Japan, Mexico, Canada, and the United States, where since their entrance in 1849 they have more than 50 establishments, including colleges, normal and parochial schools.

MARITANA, mä′rē-tä′nä. An opera by Wallace (q.v.), first produced in London, Nov. 15, 1845; in the United States, May 4, 1848 (New York).

MAR′ITIME LAW (Lat. *maritimus*, relating to the sea, from Lat. *mare*, sea). In its broadest sense, that system of law, both public and private, which relates to commerce and navigation upon the high seas or other navigable waters. The sources of the law of the sea as now applied in England and the United States are more ancient and perhaps more complex than those of any other branch of our law. Some of its doctrines, as the law of general average, are traceable to the Rhodian laws, dating back to the eighth century B.C., from which they were adopted into the civil law of Rome, and by it spread over modern Europe. Many of its doctrines may be attributed to customs established by the revival of trade in the countries bordering the Mediterranean and in southwestern Europe in the thirteenth and fourteenth centuries. During this period the commercial states and cities began the compilation of the usages and customs of sea commerce and the judgments of the various maritime courts. The earliest of these is the *Consolato del mare* (q.v.). A later compilation, having even greater influence upon

English law, was that known as the laws of Oléron. (See OLÉRON.) The laws of Wisby, a compilation of mercantile customs and usages adopted by a congress of merchants at Wisby in the island of Gotland in the Baltic Sea, about 1288, which became the basis of the ordinances of the Hanseatic League, were also of great influence in the development of the modern laws of the sea; as were also the Hanseatic ordinances and the French marine ordinance, promulgated by Louis XIV in 1681, by which the whole law of shipping, navigation, marine insurance, bottomry, etc., was collected and systematized. The local ordinances of Barcelona, Florence, Amsterdam, Antwerp, Copenhagen, and Königsberg were also not without influence.

The earliest English compilation of maritime law appears to have been the Black Book of the Admiralty, supposed to have been published during the reign of Edward III. It was based substantially upon the laws of Oléron. The British Parliament has never passed general maritime ordinances, but the maritime law drawn from the sources here indicated has been embodied in a series of decisions of the courts of admiralty jurisdiction, which, with the decisions of our own Federal courts rendered since the American Revolution, constitute the maritime law of the United States.

Maritime law is administered in England by the courts of admiralty; in the United States by the Federal courts, which, by the Constitution, have jurisdiction over all causes in admiralty. This jurisdiction of the Federal courts is not, however, exclusive, and a suitor may seek his remedy at common law in the State courts wherever the common law is competent to give a remedy. In England maritime causes are said to be those which directly affect commerce or navigation upon waters in which the tide ebbs and flows. In the United States, where the conditions are different, maritime causes are deemed to be those directly affecting commerce upon navigable waters which in themselves or by means of other waterways form a continuous highway to foreign countries. Hence the fact that commerce in a given case is carried on only upon waters within a single State does not necessarily affect jurisdiction of the Federal courts, and such jurisdiction is not dependent upon the constitutional power of Congress to regulate commerce. As maritime jurisdiction depends upon the subject matter and not the parties, a United States court may take jurisdiction over a maritime cause arising in a foreign vessel between foreigners. The exercise of jurisdiction over foreigners is, however, purely discretionary, and may be refused; and it is a general principle that a maritime court will not take jurisdiction over a ship of war of a friendly foreign nation.

Liability for torts, or common-law wrongs, is recognized and enforced by the maritime law. Maritime torts include all wrongful acts or direct injuries arising in connection with commerce and navigation occurring upon the seas or other navigable waters, including negligence and the wrongful taking of property. The maritime law, however, regards only actual damages and allows no recovery for merely nominal injury. The test for determining whether a tort is of a maritime nature is the locality where the tortious act is consummated or takes effect. Thus, an injury to a bridge or wharf by a ship, inasmuch as the injury is effected upon land, is not within the jurisdiction of the admiralty court, but an injury to a ship by a drawbridge is a maritime tort, of which the admiralty court has jurisdiction. The maritime like the common law does not recognize a right of recovery for wrongful death, but a statute may confer the right, which will then be recognized in admiralty in accordance with the settled principle that both the Federal courts of admiralty and of equity will provide a remedy for new substantive rights created by State statute. Such statutes have been enacted both in England and the United States. See COLLISIONS OF VESSELS; BOUNTY; BARRATRY.

The maritime law also recognizes and enforces contracts by awarding damages or enforcing liens which it recognizes as created on the basis of contract. In general the essential elements of a contract are the same under the maritime as at the common law. The maritime law differs from the common law only in the method by which it may enforce the contract and in attaching to the various classes of contracts certain legal incidents peculiar to each class. A contract is deemed to be of a maritime nature so as to be within the jurisdiction of an admiralty court when in its essence it is purely maritime, relating to commerce and navigation upon navigable waters as already defined, as contracts for the betterment of a vessel in aid of navigation or for the sustenance and relief of those engaged in conducting commercial operations at sea. Thus a contract of partnership in a vessel is not a maritime contract, neither is a contract to build a vessel, nor is a preliminary agreement leading to a maritime contract, as a contract to procure marine insurance, within the jurisdiction of the admiralty court. For a fuller discussion of the various forms of maritime contracts and their incidents, see such special articles as BOTTOMRY BOND; RESPONDENTIA; CHARTER PARTY; AFFREIGHTMENT; MARINE INSURANCE; SALVAGE; WHARFAGE; DEMURRAGE.

The jurisdiction of maritime courts also extends to all prize causes growing out of captures of vessels, of ships of war or privateers, made upon navigable water, or started there, although consummated on land. In England the law of prize is administered in a separate department of the admiralty court, as distinguished from the instance court in admiralty. In the United States no distinction is made between prize and other admiralty causes, all being within the jurisdiction of the district courts of the United States. By act of Congress captures made upon inland waters of the United States are deemed not to be prizes, and consequently are not within the admiralty jurisdiction of the United States courts. See PRIZE; INTERNATIONAL LAW.

The adjustment of the rights of the parties to a maritime venture in accordance with the principles of general average is also an important function of maritime courts, and the doctrines of general average are among the most important of the maritime law. (See MARINE INSURANCE, *Average.*) The English admiralty courts have by statute acquired jurisdiction over crimes committed on the high seas outside the marine league. Similar jurisdiction has by act of Congress been conferred on the United States district courts.

The peculiarities of maritime law and the character of the jurisdiction exercised by maritime courts are best illustrated by the law relating to maritime liens, which are enforced by proceedings in rem. A maritime contract may

give rise to a maritime lien when made for the benefit or assistance of a marine venture, and when made on the credit of the vessel rather than on the credit of the owner or charterer. There is a presumption that all contracts for necessary supplies and repairs to a vessel are made on the credit of the owner if in a home port, but upon the credit of the vessel if in a foreign port. The seamen and subordinate officers, but not the master of the ship, have a lien upon the ship for wages due. The marine carriers also have a lien for freight and demurrage.

Analogous to the contract lien, although strictly not based on contract, is the lien which any party to a maritime venture who has made a general average sacrifice has upon vessel or cargo, or both, to secure contribution in general average. Maritime liens may also arise *ex delicto* for all wrongs or injuries caused by the ship, or by collision, or by failure of the ship as a common carrier to carry or deliver goods safely.

It is a general principle of the maritime law that the master has the power, when necessity arises and he is unable to communicate with the owners, to sell both ship and cargo and confer a valid title on the purchaser to sell free of liens, which then attach to the proceeds. Lienors do not share pro rata in the subject of the liens, but have priority according to their importance as contributing to the safety or preservation of the property. Thus, as between different voyages, liens have priority in the inverse order of their creation. In the same voyage the order of priority is as follows: (1) costs of litigation; (2) salvage; (3) salary of seamen, cost of supplies and repairs, bottomry and respondentia, pilotage and towage.

The procedure of maritime law is extremely simple, never having been characterized by complex and technical rules, as was the procedure at common law. The most distinguishing characteristic is the power of the plaintiff to make the proceeding purely one in rem, i.e., one directed solely towards the property which the plaintiff wishes to subject to the maritime lien which he claims. The procedure may, however, at the plaintiff's option, be an action in personam, i.e., one in pursuance of which a personal judgment may be recovered against the master or owner; or, in the absence of rules of court to the contrary, it may be both in rem and in personam. The proceeding in admiralty is begun by filing a libel (q.v.) corresponding to the declaration or complaint in a common-law action. Upon filing of the libel the court issues its writ or mesne process, which is executed by the marshal or corresponding officer by attaching the *res*, i.e., the ship or cargo, if the proceeding is in rem, or by citing the respondent to appear and answer, if the proceeding is in personam. The respondent is then required to file his answer, or he may file exceptions, which correspond to the demurrer in an action at law. The issues raised are laid before a judge without a jury, or, as is more usually done, the testimony in the case is taken before a commissioner or corresponding officer, who reports it to the judge. The judge does not usually assess damages, but refers that question to a commissioner by an interlocutory judgment, and upon the commissioner's report renders a final judgment fixing the rights of the parties.

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MARITIME PROVINCE (Russ. *Primorskaya Oblast*). A name given to the former Province of Primorskaya, which extends from the Arctic Ocean, where it reaches as far west as Tchaun Bay, to the north boundary of Korea. Its west boundary runs along the Stanovoi Mountains to about long. 130° E., then southeast and south to the Amur (which traverses the province in a northeasterly direction), then along the Usuri, which forms part of the boundary of Manchuria, and finally southwest to the Korean border, along the east frontier of Manchuria to Korea (Map: Asia, O 3). Its area is made up of the provinces of Kamchatka (q.v.) (502,424 square miles), Sakhalin (14,668 square miles), and Primorskaya (226,486 square miles). The northern portion, forming the northeast extremity of Asia, is a barren plateau from 1000 to 2000 feet in elevation and watered by the Anadyr and many other rivers. Its coasts are deeply indented and present a number of promontories towards Bering Strait and Bering Sea. The plateau is bordered on the north by mountains which rise to 8000 feet. The central part of the province is a narrow strip of land, 40 to 60 miles wide, along the Sea of Okhotsk, occupied by the Stanovoi Mountains and intersected by numerous short streams.

The southern part is somewhat lower west of the Amur, while the portion east of that river is occupied to some extent by the mountainous district of Sikhota Alin, rising above 5000 feet in its highest peaks. The flora of the northern part is extremely poor, consisting only of some lichens, mosses, and dwarf trees. The lower mountain slopes of the central portion of the province and the deep river valleys are thickly wooded. The same is true of the mountains in the southern part, where the lowlands are covered with thick grass, and some plants peculiar to warmer regions, such as the wild vine, are found. Northern Siberia has long been famous for its rich fauna, but many species, such as the blue fox, the black sable, the sea otter, the sea lion, the sea cow, and the whale, have either entirely disappeared or are rapidly approaching extinction. The fauna of the southern region is remarkable for its variety, including such different species as the tiger and the bear. The rivers in this part of the country are exceedingly rich in fish, the Amur and the Usuri being filled with salmon in August, and it is along their banks that the population of the province is concentrated. The northern part of the province is inhabited chiefly by the Tchuktches, who are engaged in fishing on the coast and in reindeer breeding and hunting in the interior. Besides the Tchuktches there are found some Koryaks on the coast. The central part of the province is inhabited only by a few Tunguses.

The climate presents great variety, owing to

the large extent of the region, but even in the south it is very severe. The temperature at Vladivostok, at the southern end of the province, averages only 39.5° F., while at Nikolayevsk, at the mouth of the Amur, it is below the freezing point. The summers in the southern part are extremely wet, and inundations are frequent.

Agriculture is confined by natural conditions to the southern portion of the province and is progressing very slowly. Hunting and fishing are still the chief occupations. Some gold is produced along the Amur. Immigration has made wonderful strides since the beginning of the twentieth century, as the population figures show. This is due chiefly to the Trans-Siberian Railway, which was completed in 1898. Many Little Russian peasants and Cossacks from the Don territory and Orenburg have been transported to the province by the government. Roads are very scarce, but a branch of the Trans-Siberian line traverses the province from Khabarovsk to Vladivostok for a distance of 469 miles. Nikolskoye, 69 miles north of Vladivostok, is the eastern terminal of the Manchurian branch of the Trans-Siberian line. The population in 1897 was 223,336, including about 45,000 natives, more than 23,000 Koreans, and over 29,000 Chinese; in 1912 the population was 572,000, the density per square mile being 2. The Russians constitute over one-half of the entire population. The original Russian population are organized on a military basis, and are known as Cossacks. The capital of the province is Khabarovsk (q.v.), but the most important town is Vladivostok (q.v.).

MARITZA, mȧ-rē′tsȧ (Lat. *Hebrus*). A river of the Balkan Peninsula (Map: Balkan Peninsula, F 4). It rises in the Balkans in Bulgaria, flows southeast through eastern Rumelia past the town of Philippopolis, and continues in that direction until it enters Turkey above Adrianople, where it bends south and falls into the Ægean Sea near its northeast corner. It is 300 miles in length, and is navigable for small boats to Adrianople, about 100 miles from its mouth. The treaty of Sept. 18, 1913, between Bulgaria and Turkey makes the lower reaches of the river below Mandra the new frontier.

MARIUPOL, mä′rē-o̅o̅′pôl-y′. The capital of a district of the same name in the Government of Ekaterinoslav, Russia, situated on the north shore of the Sea of Azov, 63 miles west of Taganrog (Map: Russia, E 5). It has two Gymnasia, a theatre, and a customhouse. Soap and leather are its chief manufactures; it carries on a considerable trade in grain. Its harbor is visited annually by over 1300 coasting and about 100 seagoing vessels. Mariupol was founded in 1779 by Greek emigrants from the Crimea. Pop., 1911, 53,100, chiefly Greeks and Jews.

MA′RIUS, Gaius (c.156–86 B.C.). A Roman general, born of an obscure family of the Maria Gens, at the village of Cereatæ (modern *Casamare*), near Arpinum, about 156 B.C. (See Isola del Liri.) In the Numantine War (134–133 B.C.) he served with great distinction under the younger Scipio Africanus. In 119 B.C. he was elected tribune of the plebs, and vigorously opposed the nobles, by whom he was intensely hated. He acquired social standing and political influence by his marriage with Julia, aunt of Julius Cæsar. In 114 B.C. he went to Further Spain as proprætor, and cleared the country of the robbers who infested it. He accompanied Q. Cæcilius Metellus Numidicus to Africa in 109 B.C., was elected consul two years after, and intrusted with the conduct of the Jugurthine War, which he brought to a successful close in the beginning of 106 B.C. Marius sent Sulla, then his quæstor, to receive Jugurtha, and this laid the foundation of future personal enmity. Numidia Marius thoroughly subdued and annexed to Rome. The military success of Marius had now made him the most conspicuous officer in the Roman army, while he had aroused enthusiastic admiration among his soldiers. Meanwhile an immense horde of Cimbri, Teutones, and other northern barbarians had burst into Gaul and repeatedly defeated the Roman forces with great slaughter. In consequence Marius was again called to the consulate for the year 104 B.C., and for the third, fourth, and fifth times in 103–101 B.C., for it was felt that he alone could save the Republic. The war against the Teutones in Transalpine Gaul occupied him for more than two years; but he finally annihilated them in a battle of two days' duration at Aquæ Sextiæ, now Aix, in Provence, where 200,000—according to others, 100,000—Teutones were slain. After this he assumed the chief command in the north of Italy against the Cimbri (q.v.), whom he overthrew on the Raudian Fields, near Vercellæ, with a like destruction (101 B.C.). The people of Rome knew no bounds to their joy. Marius was declared the savior of the state, the third founder of Rome, and his name was mentioned along with those of the gods at banquets. He was made consul for the sixth time in 100 B.C. In the next 10 years, however, his prestige waned, particularly because of his association with Saturninus (q.v.). In the Social War (q.v.) he twice defeated the Marsi. When Sulla, as consul, was intrusted with the conduct of the Mithridatic War, Marius, who had long manifested an insane jealousy of his patrician rival, and was himself an aspirant for the command of this war, attempted to deprive him of the command, and a civil war began (88 B.C.). By procuring a new organization of the Roman tribes, through passage of a law to distribute the Italian allies among all the tribes, Marius secured an election to the command of the war. Sulla fled to his army at Nola, refused to resign the command, and marched on Rome. Marius was soon forced to flee, and after enduring the greatest hardships, and making numerous hairbreadth escapes, he reached Africa, where he remained until a rising of his friends took place under Cinna (q.v.). He then hurried back to Italy, in the absence of Sulla, and, along with Cinna, marched against Rome, which was obliged to yield. Marius was delirious in his revenge upon the aristocracy; a band of 4000 slaves is said to have carried on the work of murder for five days and nights. Marius and Cinna were elected consuls together for the year 86 B.C. Marius was, however, already in his seventy-first year, and died after he had held office only 17 days.

Unlettered, arrogant, and rude of manner, Marius did not possess the qualifications requisite for maintaining influence in times of peace. The effect of his personal presence is illustrated by the scene when, during his flight to southern Italy, near Minturnæ, a barbarian entered his room with drawn sword to assassinate him. When Marius called out, "Man, durst thou murder Gaius Marius?" the intruder, awed by the fiery eyes of Marius, dropped his sword in terror and fled. Consult: Beesly, *Marius and Sulla*

(New York, 1878), and the article "Marius I," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MARIUS, MERCATOR (c.390–c.451). An ecclesiastical writer of the earlier half of the fifth century, born in Africa. He was living in Rome, 418, and 10 years afterward in Constantinople, where he stayed until about 448, but authorities differ as to whether he was priest or layman. He is known to have been a friend and defender of Augustine, a denouncer of the Pelagian and Nestorian doctrine. His determined opposition to the promulgators of these heresies bore fruit in their expulsion from Constantinople. He made Latin translations of Nestorius, Theodosius of Mopsuestia, Cyril of Alexandria, Proclus, Theodoret, Pelagius, and other Greeks which are invaluable to students of Church history. These, together with his own controversial writings, were twice edited in Paris —in 1673 by Garnier and in 1684 by Baluze.

MARIVAUX, mȧ'rē'vō', PIERRE CARLET DE CHAMBLAIN DE (1688–1763). A French dramatist important in the development of French comedy, and a novelist, epoch-making in the evolution of French fiction. He was born in Paris, Feb. 4, 1688. His father was a Norman, director of the Mint at Riom in Auvergne, where and at Limoges Marivaux passed his youth. His literary taste developed early. At 18 he had written a play, *Le père prudent et équitable* (published 1712), and between 1713 and 1715 he produced three romances, *Effets surprenants de la sympathie, La voiture embourbie,* and *Le Don Quichote moderne,* all wholly out of key with his later work. Then, falling under the influence of the parodist La Motte, he undertook to travesty Homer and Fénelon, but turned from this ignoble task to the production of essays in the vein of the *Spectator* for the journal *Le Mercure* (1717). These showed keenness, but also preciosity. The year 1720 marks a turning point in Marivaux's genius and fortune. He lost his considerable wealth in the Mississippi Scheme, became dependent on his pen, wrote a poor tragedy, *Annibal,* and a good comedy, *Arlequin poli par l'amour,* and started the *Spectateur Français,* a weekly "Spectator," that might have succeeded if his unmethodical habits had allowed it to appear regularly. For the next 20 years he supported himself as a playwright, succeeding in comedy at the Italian Theatre and failing in tragedy at the Théâtre-Français. The more noteworthy of his 30 plays are: *Les surprises de l'amour* (1722); *Le triomphe de Plutus* (1728); *Le jeu de l'amour et du hasard* (1730); *Le legs* (1736); and *Les fausses confidences* (1737). He founded two other unsuccessful journals, and in 1731 began the publication of a novel, *Marianne,* which he left incomplete at its eleventh part in 1742. Madame Ricciboni finished it. In 1735 he began *Le paysan parvenu,* which also remained a torso. Yet these are his most important works. In 1736 he was elected to the Academy. Late in life he received a pension from Helvétius (q.v.) and another from Madame de Pompadour (q.v.). He died Feb. 12, 1763. Marivaux shows himself in his dramas and in his fiction interested primarily in the analysis and display of human feeling. He drew in both his novels pictures of contemporary society and of Parisian street life that remained unequaled for a century in their impressionistic realism, but his delight is in verbal surprise—a somewhat affected style known in French literature as *marivaudage.* Marivaux's *Works* are in ten volumes (Paris, 1827–30). There is a modern edition of the plays by Fournier and also of *Marianne.*

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MAR'JORAM (OF. *marjolaine, margelyne,* Fr. *marjolaine,* It. *majorana, maggiorana,* from ML. *majoranca,* from Lat. *amaracus, amaracum,* from Gk. ἀμάρακος, *amarakos,* ἀμάρακον, *amarakon,* marjoram, probably connected with Heb. *māraq,* to purify; influenced by popular etymology with Lat. *major,* greater), *Origanum.* A genus of annual, perennial, and shrubby plants of the family Labiatæ, natives chiefly of the East and of the Mediterranean region. Some of the species abound in a yellow essential oil, marjoram oil or oil of origanum, which is obtained by distillation. The common marjoram (*Origanum vulgare*), which has become naturalized in the United States, is a perennial plant, 1 foot high, with ovate leaves and roundish, panicled crowned heads of purple flowers, with large bracts. It is used, as are also other species, as a seasoning in cookery, and is said to be stimulant and tonic. Sweet marjoram (*Origanum majorana*) is an annual plant, a native of Greece and the East, with ovate grayish-green leaves, wrinkled bracts, and small white flowers. Its uses are similar to those of the common marjoram.

MARJORIBANKS, märch'bănks, EDWARD, second BARON TWEEDMOUTH. See TWEEDMOUTH.

MARK, märk (Ger., border, march). A German geographical term, signifying primarily the *mark* of a country's limits (the *march*), and hence applied as a designation of the border districts of the German Empire. Prussia began its existence as the north mark, erected against the invasion of the Wends, while Austria arose from the east mark, erected against the Hungarians. The governor intrusted with the charge of one of these border districts was called *markgraf,* or margrave (q.v.). There has been a long dispute among scholars as to the original meaning of *mark.* On this dispute, consult Maurer, *Geschichte der Markenverfassung in Deutschland* (Erlangen, 1856), and Fustel de Coulanges, *Histoire des institutions politiques de l'ancienne France* (6 vols., Paris, 1888–1908).

MARK (AS. *marc,* Ger. *Mark;* perhaps identical originally with *mark,* token, boundary). Originally the term appears to have been used to designate a unit of weight, most commonly of gold or silver. It was about equal to eight ounces, but it varied from country to country. In 1524 the Cologne mark was made the standard weight for gold and silver throughout the Holy Roman Empire, but the standard was never properly enforced. In Anglo-Saxon times the term "mark" was used to designate a money of

account, consisting of 100 pennies—in the twelfth century, 160 pennies. In 1663 a silver mark was issued in Scotland which was valued at 13s. 1d. English money. In the nineteenth century the mark was a common small coin among the German states, varying considerably in the different parts of Germany. In 1873 the gold mark of 100 pfennige was adopted as the monetary unit of the German Empire. It represents 0.3982 gram of gold (900 fine) and is valued at $0.23821 in American money.

MARK (Lat. *Marcus*, Gk. Μάρκος, *Markos*), or JOHN, with the surname MARK (Acts xii. 12). The writer of the second Gospel. The incidental notices in the New Testament give the following facts: Mark was the son of a certain Mary, a householder of Jerusalem, at whose home the early Christians held meetings in the days of persecution (Acts xii. 1–12). He was a cousin of Barnabas (Col. iv. 10), hence, possibly, in case the relationship was on the father's side, of Levitical descent. An old tradition says that he had his thumbs cut off so as to be unfit for the priesthood. Peter calls him his "son" (1 Pet. v. 13), which means probably that he was converted to Christianity under Peter's ministry in Jerusalem. He came to Antioch from Jerusalem with Barnabas and Paul (Acts xii. 25), and accompanied them as an assistant on their first missionary journey (Acts xiii. 5). But he left them at Perga and returned to Jerusalem (Acts xiii. 13; cf. xv. 37–39). His action cost him Paul's confidence, and when Barnabas proposed to take him on a second journey Paul refused. The result was a separation, and Barnabas took Mark and went to Cyprus (Acts xv. 37–40). This was about 50 A.D. We hear nothing more of him until Paul's first Roman captivity (c.60 A.D.), when we learn (Col. iv. 10; Philem. 24) that he was then in Rome, reconciled to Paul and esteemed by him, and was about to visit Asia Minor. He may have come to Rome with Peter, who mentions him (1 Pet. v. 13) as with him in the city. The proposed journey to Asia was probably undertaken, as he was in the East when Paul wrote from Rome (c.65) to Timothy at Ephesus (?) asking him to bring Mark with him (2 Tim. iv. 11). At Rome, according to early tradition, he wrote his Gospel, not altogether as his own work, but as containing the substance of Peter's preaching. Another tradition makes him the organizer and first Bishop of the Alexandrian Church. In the nature of the case such traditions are difficult of proof. Consult the commentaries on Mark, especially that of Swete (London, 1898), and Zahn, *Einleitung in das neue Testament*, vol. ii (Leipzig, 1900). See MARK, GOSPEL OF.

MARK, EDWARD LAURENS (1847–). An American anatomist, born at Hamlet, N. Y. He graduated at the University of Michigan in 1871 and in 1872–73 acted as assistant astronomer on the United States Northwest Boundary Survey. He then studied zoölogy in Europe under Leuckart, Haeckel, and others, and obtained his Ph.D. at Leipzig in 1876. In 1877 he was appointed instructor at Harvard College, in 1883 assistant professor of zoölogy, in 1885 Hersey professor of anatomy, and in 1900 director of the Zoölogical Laboratory. In 1903 he became director of the Bermuda Biological Station for Research. In 1904 he was elected president of the American Society of Naturalists. His publications include: *Maturation, Fecundation, and Segmentation in Limax campestris* (1881); *Simple Eyes in Arthropods* (1887); *Trichinæ in Swine* (1889); *Studies on Lepidosteus* (1890); a translation from the German of O. Hertwig, *Text-Book of the Embryology of Man and Mammals* (1892), and a translation of Korscheldt and Heider, *Text-Book of the Embryology of Invertebrates* (1895–1900). Consult Parker (ed.), *Mark Anniversary Volume* (New York, 1904).

MARK, GOSPEL OF. The second of the New Testament Gospels. Its first verse opens with a phrase ("The beginning of the gospel of Jesus Christ") that is evidently intended to be a caption for the narrative which follows. The narrative is arranged simply and in an order which, while not always exact, is usually the normal chronological order of the Gospel events. There is first the preliminary history reciting the ministry of John the Baptist and the entrance of Jesus upon his work, through the symbolic act of the baptism and the personal experience of the temptation (i. 2–13). There then follows the main portion of the narrative, which gives, first, Jesus' popular work in Galilee (i. 14–vii. 23) and his similar work in the region north of Galilee (vii. 24–viii. 26), and then breaks in upon this northern work with a presentation of it in the light rather of a work of instruction, chiefly to his disciples, than a work of construction among the people (viii. 27–ix. 29). This new character of Jesus' work is carried on into what may be generally considered his journey towards Jerusalem (ix. 30–x. 52). The event that marks this change is the disciples' confession of Jesus' Messiahship given in the neighborhood of Cæsarea Philippi, which was followed by Jesus' first clear declaration of his coming death (viii, 27–ix. 1). This is evidently considered by the Evangelist as the turning point in Jesus' work, leading him to a change in its character and method. Chapters xi–xiii are given to the final work in Jerusalem, which Mark, in common with the other Evangelists, presents as a work in which Jesus' Messianic claims are openly laid before the nation's religious leaders. The narrative closes, as in all the Gospels, with the Passion and Resurrection (xiv–xvi).

It is universally held that verses 9–20 of the last chapter (xvi) are a later addition to the Gospel, the original ending being generally regarded as lost. Just how much further the narrative went and whether it included, as Luke alone can be possibly said to do, an account of the Ascension, can only be conjectured.

In comparison with the other Synoptists Mark is quite distinctly the shortest Gospel, considerable portions of the history appearing in Matthew and Luke being absent from Mark—such as the Nativity, the Sermon on the Mount, and that part of Luke which is devoted apparently to a story of Jesus' last journeyings to the Holy City; and yet where Mark gives the narrative in common with the other two he gives it with a fullness of graphic detail which the others do not possess. It is also characteristic of Mark that, though he has an account of the parables by the Sea of Galilee, he does not give the discourses of Jesus in a measure equal to that of Matthew and Luke. In the opinion of most critics this indicates that Mark had not access to, or at least did not make use of, the Logia collection of Matthew, though some hold that he made a moderate use of it. See MATTHEW, GOSPEL OF.

It is plain that this Gospel was written by a

Jewish Christian—not because of any Jewish cast of the Gospel, as in the case of Matthew, for such a cast it does not possess—but because (*a*) of the author's familiarity with Jewish things and his ready ability in explaining them (cf. ii. 18; vii. 3 et seq.; xii. 18; xiv. 12; xv. 6, 42), and (*b*) because of his acquaintance with the Aramaic language, expressions from which he frequently uses (cf. iii. 17; v. 41; vii. 11, 34; ix. 43; x. 46; xiv. 36; xv. 22, 34). On the other hand, it is clear that the readers were Gentile Christians—not simply because they were unacquainted with Palestinian customs and speech, but because this ignorance seems to be surrounded by a very general Latin atmosphere, as though the readers not merely needed the above interpretations and explanations, but needed them cast in this mold (cf. v. 9; vi. 27, 37; vii. 4; xii. 42; xv. 16, 39). As to the place of the Gospel's origin there is nothing definite to be gathered from the contents, though many modern scholars accept the opinion of Clement that it was written at Rome. The Latin atmosphere would most easily be thrown around the narrative in a Latin country. As to date, 64 to 70 A.D. are limits often suggested; but it is universally admitted that whatever may be the year of its composition, it gives every evidence of being the earliest of all the Gospels. In fact, a comparison of Mark's order of narrative with that of Matthew and Luke shows that Mark's order was that which Matthew and Luke had before them when they wrote. See MATTHEW, GOSPEL OF; LUKE, GOSPEL OF.

Early church writers, almost without exception, ascribe the authorship of this Gospel to Mark (q.v.), the cousin of Barnabas, and to Mark as in some way connected in the writing with Peter. Some of the Fathers, as Jerome and Origen, make the relation of Mark to Peter that of an amanuensis; others, as Eusebius, that of a reporter; others again, as Clement of Alexandria, Justin Martyr, and Irenæus, that simply of a disciple recalling his master's words. The earliest and most explicit testimony, and that which seems to bear upon its face the strongest proof of credibility, is the testimony from Papias, who describes Mark as the interpreter of Peter's preaching, and Mark's Gospel as his conscientious reproduction of what Peter's discourses contained. This testimony of Papias would agree with the original Greek character of the Gospel's composition; for, according to this testimony, the service which Mark rendered to Peter was evidently that of interpreting his Aramaic discourses into the Greek, which his audiences could understand. It would further agree with the fresh and vivid style of the Gospel's narrative; since such immediate contact with Peter's reminiscences as Mark must have had would give the stamp of an eyewitness to all his record. And it would yet further agree with a certain Petrine element which seems to be present at frequent points in the Gospel, since, however Mark may have reconstructed these discourses of Peter, he is not likely to have lost out of them altogether the personal element they must have contained.

Accordingly, the general verdict of criticism is that the second canonical Gospel is from the hand of Mark and in part reproduces Peter's personal knowledge of and participation in the Gospel events. At the same time this verdict attaches only to the substance of the Gospel, since there are clear traces of documentary sources in the latter part of the Gospel, as in the discourse regarding the future in chap. xi, which could not come from Peter's oral stories. The question also arises whether Mark as we now have it may be an enlarged edition of the original Mark. On this subject there is not a unity of opinion; but, since the enlargement was in any case not great, the question is relatively unimportant.

Naturally in proportion as Mark's Gospel is the reproduction of Peter's preaching, so far must its purpose be a homiletic rather than a purely historical one. This purpose was to show that the deeds of Jesus proved his mission as a messenger from God. It was not so much to tell the story of Jesus' life, as to testify to the impression which Jesus himself had made upon the spiritual experience of his followers.

Bibliography. Besides the usual New Testament Introductions, the introductory portions of the more recent commentaries on Mark, and the special Synoptic works referred to in the literature attached to the article on the Gospel of Matthew, consult: J. C. Du Buisson, *Origin of the Gospel of St. Mark* (Oxford, 1896); F. P. Badham, *St. Mark's Indebtedness to St. Matthew* (London, 1897); Arthur Titius, "Das Verhältniss der Herrenworte in Markus Evangelium zu den Logia des Matthäus," in *Theologische Studien* (Göttingen, 1897); W. Hadorn, *Die Entstehung des Markusevangelium* (Gütersloh, 1898); Friedrich Blass, *Philology of the Gospels*, translated from the German (London, 1898); H. B. Chajes, *Markus Studien* (Berlin, 1899); Abbott, *The Corrections of Mark* (London, 1901); E. D. Burton, *Studies in the Gospel According to Mark* (Chicago, 1904); Burkitt, *The Gospel History and its Transmission* (2d ed., Edinburgh, 1907); B. W. Bacon, *The Beginnings of Gospel Story* (New Haven, 1909).

MARK ANTONY. See ANTONIUS, MARCUS.

MARKBY, märk'bĭ, SIR WILLIAM (1829–1914). An English jurist, born at Duxford, Cambridgeshire, the son of a clergyman. He was educated at Bury St. Edmunds and at Merton College, Oxford. He became a barrister in 1856 and 10 years later went to Calcutta as judge of the High Court. Upon his return to England in 1878 he was reader in Indian law at Oxford until 1900. He was a commissioner on the administration of justice in Trinidad and Tobago in 1892. Markby was knighted in 1889; 10 years earlier Oxford had made him a D.C.L. An eminent authority on Indian law, he published *Lectures* on that subject and the well-known *Elements of Law Considered with Reference to General Principles of Jurisprudence* (6th ed., 1905).

MARKET. See MARKETING ASSOCIATIONS, AGRICULTURAL.

MARKET BOSWORTH. See BOSWORTH.

MARKET BUILDINGS. From the earliest antiquity it has been the custom to reserve in cities and towns a space where farmers and merchants could exhibit and sell their commodities, and such spaces were sometimes surrounded with porticoes or with public buildings and entered by monumental gates. The gate of the Agora at Athens (c.40 B.C.) is still extant, and the foundations of a circular structure in Pompeii are identified as those of the Macellum (meat market). The Forum Boarium (cattle market) and Forum Olitorium (oil market) in Rome illustrate the practice of providing special places for particular commodities. This prac-

tice still prevails in all large cities, and the names Grassmarket, Haymarket, Piazza dell' Erbe, and the like preserve in many old cities the memory of the original use of the places or squares which bear them. In process of time various types of accessory buildings were developed in association with market places, such as belfries, clock towers, and crosses, usually standing in the centre or at one side of the open space and serving as stands from which proclamations and addresses could be made. Such were the loggias of the Mercato Vecchio and Mercato Nuovo in Florence, the Poultry Cross at Salisbury (England), the Tour de la Vieille Horloge at Rouen (France). A decorative fountain was a frequent feature, especially in Italy and Germany.

The erection of covered buildings provided with permanent stalls to serve the purposes originally met by mere open spaces was not common until late in the eighteenth century. Yet as early as the thirteenth century the grain market of Florence was housed in a massive arcaded building later converted into a church, the Or San Michele, and in the sixteenth century the Shah Abbas surrounded the Meïdan-Shah at Ispahan with arcades providing shelter for merchants, while both there and in Constantinople certain streets were covered with vaulted roofs and given over to particular trades—the famous bazars of the Orient. The modern practice is to erect specially designed structures with stalls to be rented to the dealers, and so arranged as to furnish convenient access on the one hand to the supply wagons and on the other to the customers. Ventilation, drainage, water supply and refrigeration are scientifically provided for. The materials of construction are selected with especial reference to durability and cleanliness, and in many cities the markets are under the close supervision either of the health authorities or of a special officer or bureau.

The earliest market buildings were little more than sheds, of more or less architectural design, around a square in which a fountain supplied running water (Marché St. Germain, Paris). In 1811 the Halle au Blé, a circular grain market and exchange, covered by a dome of timber construction over 100 feet in diameter, was burned, and a new dome was built of iron, the earliest metallic roof of large space. In 1846–52 were built the vast Halles Centrales, by Baltard, covering over eight acres, in two blocks, with a lofty central avenue and four intersecting streets. This building, of iron and glass (except the lower part of the walls which is of brick), still admirably fulfills its purpose, and has been a model for other cities to follow. Smithfield Market, London, is another vast market of somewhat later date, of brick and stone, iron and glass, devoted to the wholesale meat trade. Important market buildings exist in nearly all large European cities; those of most American cities are far inferior to these in design and maintenance, and none deserves special mention. The early markets and their buildings were the precursors and prototypes of the modern exhibitions. See METAL WORK IN ARCHITECTURE; EXHIBITIONS, ARCHITECTURE OF.

MARKET CROSS. See CROSS.

MARKETENDERIN, DIE (Ger., The Canteen-Woman). An opera by Humperdinck (q.v.), first produced in Cologne, May 10, 1914.

MARKETING ASSOCIATIONS, AGRICULTURAL (AS. *market*, from Lat. *mercatus*, traffic, market, from *mercari*, to trade, from *merx*, merchandise, from *merere*, to earn, deserve; connected with Gk. *μέρος*, *meros*, share). A market may be defined as a place where goods are bought and sold. A market may consist of a public place or building used for the exchange of goods, or in a broader sense it may consist of the world, a country, a city, or a locality, as world market, foreign market, domestic market, Chicago market, etc. The markets may vary by the type of produce sold, as a fish market, wheat market, live-stock market, etc.

Markets have existed from the time when men began to diversify their products. At first they were entirely local in character. To-day, in Europe nearly every town, and in America nearly all the large cities, have one or more market places. These may be simply open public squares in some centrally located district, or they may be substantial buildings fitted up with stores, booths, and containing cold-storage rooms for the preservation of perishable goods. The primary object in establishing such markets was to enable the producer and consumer to deal directly with each other.

As transportation facilities improved the area over which exchange took place increased accordingly. The development of cold storage and refrigeration widened the area from which perishable products are obtained and lengthened the season during which they are available. The ease and cheapness with which agricultural products may be carried long distances has brought about a very complicated system of marketing and given employment to a large number of middlemen. Many purchasers of agricultural products send their agents to the farms and purchase produce direct, but in the majority of instances one or more persons intervene in the process. There have been developed among farmers associations or organizations to eliminate one or more of these intermediators. The farmers have formed coöperative elevators to handle their grain, coöperative creameries and cheese factories to manufacture and sell their dairy products, egg circles to collect and sell their eggs, and produce exchanges to sort, distribute, and sell their fruits and vegetables.

The purpose in forming the coöperative organizations is to improve the business methods and add to the efficiency in the distribution and sale of farm products. Generally the organization is so arranged that each member benefits in proportion to his contribution of the produce sold. Generally he can own but one share and have but one vote. There are many modifications of this form, but the closer the organization adheres to these principles the greater is its chance of success.

Some of the advantages of coöperative marketing are that a group of farmers dealing in the same produce are normally educating one another and thus improving their methods of production. This improvement will generally take the form of a more uniform production, either through the growing of a better variety or through the better methods of packing and grading. Other advantages of coöperative marketing are the lower costs in distributing a large shipment than many small ones, the prompt news service with regard to prices and market conditions in large trade centres, and the ability to sell on the market offering the best inducements. Coöperative selling associations can con-

trol sufficient capital and employ able managers, and sell only to trustworthy persons who can be depended upon to pay cash on delivery and thus eliminate the necessity of the producer having much capital himself.

In associated marketing the producers insure one another against loss in particular sales, in that the association does not distribute the proceeds of each sale but accumulates the proceeds of all the sales and distributes the net amounts. This type of marketing association has been extensively developed in distributing the more or less perishable produce of the farmer. Co-operative marketing has been developed in the United States principally for the sale of fruits, vegetables, dairy products, and grains. In many European countries the coöperative idea has extended to the slaughtering and packing of various animals and to the gathering and distributing of poultry and eggs. The coöperative idea has had its greatest development in Denmark, where it revolutionized the agriculture of the country and added greatly to the prosperity of its rural population.

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MARKET OVERT (Fr. *ouvert*, open). In the English law, an open or public market. The law of *market overt* is that the purchaser in good faith gets a good title to any goods which he may buy in such a market, even though the vender did not own or have a right to sell them. The law originated in an old Saxon custom which prohibited the sale of anything above the value of 20 pence, except in open market and in the presence of witnesses. The theory was that lost or stolen goods would probably be identified in a public market by the owner before the tradesman or original thief could dispose of them. This custom became the law of England after the Conquest, and was modified so as to include goods of any value and to dispense with the necessity of witnesses. It is applied to every kind of personal chattel except horses. By subsequent statutes the law was further modified, so that at present if stolen goods are sold in open market the title revests in the owner upon the conviction of the thief. Only certain ancient markets have this character, outside of London, where every public shop is a market overt and every day is market day. This law has never existed in the United States. See SALE.

MARKET VALUE. The value of an article as established by public sales of such property in a particular locality. Market value may be established by regular market quotations where these exist or by the testimony of persons familiar with the price at which such property sells regularly in the market. If the market price is abnormally enhanced or depressed at the time and place for delivery of any goods, by wrongful combinations or by an illegal monopoly, other evidence than the market sales may be resorted to for the purpose of showing the fair market value of the property in question. Consult the authorities referred to under TORT; DAMAGES; CRIMINAL LAW.

MARK'HAM, SIR ALBERT HASTINGS (1841–). A British admiral, distinguished for his participation in Arctic exploration. He was born at Bagnères. After his education in the Royal Navy Academy at Southsea, he entered the navy and served in China (1856–64), where he was commended for efficiency in the suppression of the Taiping rebellion and for his part in the operations leading to the fall of Peking. He rose to lieutenant (1862), commander (1872), captain (1876), rear admiral (1892), and admiral (1903). To advance the interest of Arctic exploration, he made a cruise in Baffin Bay in the whaler *Arctic*, which brought back in 1873 survivors of the *Polaris* American Arctic expedition. He commanded the *Alert* in the British Arctic expedition of 1875–76, when he reared the Union Jack, May 23, 1876, on the Arctic Ocean to the north of Grinnell Land, in the most northern point reached up to that time (83° 20′ 26″). In 1879 he made a cruise to Nova Zembla. From 1901 to 1904 he was commander in chief at the Nore, and in 1906 he retired. Among his publications are: *The Cruise of the "Rosario"* (1873); *A Whaling Cruise to Baffin Bay* (1874); *The Great Frozen Sea* (1877); *A Polar Reconnaissance* (1880); *Life of Sir John Franklin* (1890).

MARKHAM, SIR CLEMENTS ROBERT (1830–1916). An English traveler, geographer, and author, born at Stillingfleet, York. He was educated at Westminster School and in 1844 entered the navy. In 1850 he was made lieutenant and in 1851 accompanied the expedition sent to search for Sir John Franklin; traveled in Peru (1852–54); accompanied the British expedition against Abyssinia (1867–68); entered the geographical department of the India Office (1867–77); was editor of the *Geographical Magazine*, secretary of the Hakluyt Society in 1858–87, and later secretary and then president of the Royal Geographical Society, from which he retired in 1905. He was knighted in 1896. He published: *Franklin's Footsteps* (1852); *Travels in Peru and India* (1862); *A History of the Abyssinian Expedition* (1869); *Major James Rennell and the Rise of Modern English Geography* (1895); *Richard Hakluyt: His Life and Work, with a Short Account of the Aims and Achievements of the Hakluyt Society* (1896); *Memoir of Archbishop Markham* (1906); *Richard III* (1906); *Quichua Dictionary* (1908); *Life of Sir Leopold McClintock* (1909); *The Story of Majorca and Minorca* (1909); *The Incas of Peru* (1910).

MARKHAM, (CHARLES) EDWIN (1852–). An American poet, born in Oregon City, Oreg. When 5 years old he was taken to live in California, and there during his boyhood he worked at farming, blacksmithing, and cattle and sheep herding. The San José Normal School and two Western colleges equipped him to serve first as a school principal and later as a school superintendent in California. He began to write verse for the California papers at an early age. His best-known poem, *The Man with the Hoe*, published in book form with other verses in 1899, had an immense vogue and made his name known the country over. He followed his success East, and resided in or near New York

City, where he was engaged chiefly in journalistic work for many years. He was elected a member of the National Institute of Arts and Letters. His other books include: *Lincoln and Other Poems* (1901); *The Poetry of Jesus* (1909); *Children of Bondage* (1909), with others; *The Shoes of Happiness, and Other Poems* (1914); *California the Wonderful* (1914).

MARKHAM, Gervase or Jervis (c.1568–1637). An English author, born at Gotham, Nottinghamshire. He served as a soldier in the Low Countries and attained a captaincy in the English army. Well versed in the classical and modern languages, he took up literature as a means of livelihood and prepared numerous volumes for the press. He wrote largely on topics connected with sport, and is also known for some indifferent poetry. A few works attributed to him were certainly written by others, but those regarded as genuine include: *The Most Honorable Tragedie of Sir Richard Grinvile* (1595); *The Poem of Poems* (1595); *Cavelarice, or the English Horseman* (1607); *Hunger's Prevention* (1621).

MARKHAM, William (c.1635–1704). An American Colonial Governor, born in England. He was a first cousin of William Penn, by whom he was sent to America as Deputy Governor of Pennsylvania after the grant in 1681. On his arrival at New York, Brockholls, acting Governor in the absence of Andros, surrendered his authority over Penn's grant and gave him a letter to the local authorities. Proceeding to Pennsylvania, Markham called a council Aug. 3, 1681, and almost immediately began a controversy with Lord Baltimore about the Maryland boundary. He chose the present site of Philadelphia for the great city to be built, instead of that of the Swedish settlement of Upland (Chester), which was Penn's choice. When Penn arrived in 1682 Markham went to England to represent the colony in the boundary dispute, and when Penn returned to England Markham came again to America and was made Secretary of the Province and the Territories (the lower counties on the Delaware). He was Deputy Governor of the Territories in 1691, and was Lieutenant Governor for Governor Fletcher of New York (1693 to 1695), the crown having revoked the grant made to Penn and assumed control. He was continued in office until 1699 by Penn, who in 1694 had again secured possession, and during this time the new constitution was passed. Many charges, such as conniving at piracy and using courts to protect fraud, were made against him. Penn was not altogether satisfied with his course, but ordered him to be appointed Register-General of Wills in 1703. Markham was an Episcopalian and therefore out of sympathy with the aims of the Friends, nor was he a man of the force of character needed to cope with the Quakers.

MARKHOR, mär′kôr. See Goat.

MARKING-NUT. The fruit of *Semecarpus anacardium,* a large tree of the family Anacardiaceæ, a native of the mountains of India. It has oblong leaves and terminal panicles of flowers. The fruit is a heart-shaped, black nut, seated on a large swollen receptacle, which when ripe is roasted and eaten, although when raw it is astringent and acrid. Between the two coats of the nutshell is a black, acrid juice, much in use for marking cotton cloths, a mixture of quicklime and water being applied to prevent it from running and to brighten the color. It is also used as an external application in rheumatism.

MARKIRCH, mär′kêrk (Fr. *Sainte-Marie-aux-Mines*). A town of Upper Alsace, Germany, situated on the Leber, 40 miles southwest of Strassburg. It is an important manufacturing centre for cotton and woolen goods, and there is also a large dyeing industry. In the Middle Ages the town was famous for its silver, copper, and lead mines, which were abandoned during the nineteenth century, but reopened early in the twentieth. Cotton weaving was begun here in 1755. Markirch was occupied by the French in the European War which broke out in 1914. (See War in Europe.) Pop., 1910, 11,778, about one-half Protestants.

MARK′LAND, Jeremiah (1693–1776). An English classical scholar and text critic. He was born at Childwall, England, and was educated at London and Cambridge. His works included a number of emendations of the text of Lysias and of Euripides, made partly in notes contributed to the edition of Lysias by Taylor and to Musgrave's edition of the *Hippolytus* of Euripides, partly in editions of the *Supplices,* the *Iphigenia in Aulide,* and *Iphigenia in Tauride* of Euripides; an edition of the difficult *Silvæ* of Statius (1728, 1824), which is considered a masterpiece of acute criticism; and *Remarks on the Epistles of Cicero to Brutus* (1745), in which he tried to prove them spurious. His attacks on the authenticity of the Ciceronian orations *Pro Domo Sua, Post Reditum in Senatu, Ad Quirites,* and the *De Haruspicum Responsis,* in which he was afterward followed by F. A. Wolf, started a famous and long-standing controversy. Consult Wolf, *Litterarische Analekten,* vol. ii (Berlin, 1818), and J. E. Sandys, *A History of Classical Scholarship,* vol. ii (Cambridge, 1908).

MARKLE, John (1858–). An American coal operator, born at Hazelton, Pa. He graduated from Lafayette College in 1880; became general superintendent in the mines of his father's company; and later became president of the G. B. Markle Company, the successor of his father's firm and one of the largest "independent" anthracite-coal firms in Pennsylvania. John Markle represented the independent operators in the negotiations with President Roosevelt in the settlement of the anthracite coal strike of 1902, and he became president and chief engineer of the Jeddo Tunnel Company and of the Wilkes-Barre and Hazelton Railroad.

MARKOE, Thomas Masters (1819–1901). An American surgeon. Born in Philadelphia, he graduated from Princeton in 1836 and from the College of Physicians and Surgeons, New York, in 1841. He was professor of anatomy in Castleton Medical College, Vermont, and of pathological anatomy at the medical department of the University of the City of New York (1852–54). In 1860 he became adjunct professor of surgery in the College of Physicians and Surgeons, being elected professor in 1870 and professor of the principles of surgery in 1879. He is author of *A Treatise on Diseases of the Bone* (1872).

MARKS, Mrs. L. C. See Peabody, Josephine Preston.

MARK TWAIN. The nom de plume of S. L. Clemens.

MARL (OF. *marle, merle,* Fr. *marne,* OHG. *mergil,* Ger. *Mergel,* from ML. *margila,* dim.

of Lat. *marga*, marl, from Gall. *marga*, Bret. *marg*, marl, Gk. ἄργιλος, *argilos*, white clay). A somewhat indefinite term applied in different localities to widely different materials. In a general sense it means essentially a naturally occurring mixture of calcium carbonate and clay with more or less sand, which usually falls to pieces on exposure to the air. Although probably the greater number of the marls of the United States conform to this definition, and depend for their agricultural value on their lime content, there are quite extensive deposits of the Cretaceous marls, known as greensand (especially in New Jersey), which contain variable but usually small amounts of lime and considerable amounts of potash (mainly silicate) and phosphoric acid. The name is also sometimes applied to friable clays, or mixtures of clay and sand, in which there is almost no trace of lime. Marl beds are widely distributed in the Atlantic coastal plain and have been exploited to a considerable extent in New Jersey, Maryland, Virginia, North Carolina, and South Carolina. The marls of these deposits generally belong to three classes and occur in geological formations which are found, as a rule, one above the other in immediate succession. The upper layer, blue or shale marl (Neocene), generally found at or near the surface, consists chiefly of sea mud with partially decomposed shells and bones. Its value depends mainly upon its content of carbonate of lime (40 to 50 per cent), although it contains in addition small percentages of potash (0.25 to 4.75 per cent) and phosphoric acid (trace to 1.75 per cent). This class predominates in Maryland, Virginia, and North Carolina, and has been used to a considerable extent with good results on worn-out or naturally infertile soils. The second class, Eocene or chalky marl, is commonly a coarse, friable chalk, consisting of comminuted shells and corals, of a light yellowish or grayish color to white, sometimes compacted into a solid limestone. Its content of lime is greater (50 to 95 per cent) than that of the shell marl, and the percentage of potash and phosphoric acid is smaller. In the lower layer occur the Cretaceous marls (greensand), which vary considerably in chemical composition and agricultural value. Their fertilizing value is determined largely by their content of potash (3.5 to 7 per cent) and phosphoric acid (1 to 4 per cent), although many are calcareous (1.25 to 9 per cent of lime). These marls have long been used with beneficial results by New Jersey farmers, although the benefit is more marked in case of marls rich in phosphoric acid and lime than in case of pure greensand containing a high percentage of potash, probably because the potash is in the form of an insoluble silicate (glauconite) and is very slowly available to plants.

Marl is both a direct and an indirect fertilizer, improving both the chemical and physical conditions of soils, correcting acidity, unlocking insoluble plant food, and promoting nitrification. It is very lasting in effect and has been used from ancient times for improving soils. But because lime (q.v.) is quicker in action it has been used in many cases instead of marl, although some kinds of marl are extremely useful on certain soils. On account of its bulkiness and the large amounts which must be applied in order to secure beneficial results, marl can be used profitably only in close proximity to the deposits. Booth, in a report of the State geologist of Delaware, recommends 60 to 100 bushels per acre as the proper amount to be applied on poor light soils, 100 to 200 bushels on clay soils, while 200 to 500 bushels may be used with advantage on soils of good quality abundantly supplied with humus. The addition of quicklime to marl (30 to 40 bushels of lime to 300 to 400 bushels of marl) has been found to quicken the action of the marl. It is generally advisable to let marl lie exposed to the air some time before it is incorporated with the soil, that any poisonous compounds present may be destroyed.

The foregoing applies particularly to the impure marine marls of the coastal plain and their use for fertilizer. In those parts of the glaciated region where the soil is somewhat calcareous, e.g., in Maine, northwestern Connecticut, western New York, northern Indiana, and southern Michigan, marl deposits of quite a different type are found. They are formed in lakes, largely through the action of algæ on calcareous water, and sometimes attain a thickness of 100 feet. This fresh-water marl is nearly pure calcium carbonate, and in recent years has been used very largely in the manufacture of Portland cement, especially in Michigan. Consult: Edmund Ruffin, *Calcareous Manures* (Shellbanks, Va., 1835); Ullmann, *Kalk und Mergel;* State geological reports of Alabama, Delaware, Florida, Georgia, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, South Carolina, and Virginia; Maryland Agricultural Experiment Station Report, 1889; and especially *Bulletin 243* of the United States Geological Survey (1905), on "Cement Materials and Industry of the United States," by E. C. Eckel.

MARLATT, märʹlăt, Charles Lester (1863–). An American entomologist, born at Atchison, Kans. He was educated at the Agricultural College at Manhattan, Kans. (B.S., 1884; M.S., 1886), where he was assistant professor for two years. From 1889 to 1894 he was assistant entomologist, and thereafter first assistant and assistant chief entomologist, of the Bureau of Entomology, United States Department of Agriculture. He made entomological investigations for the Department in China, Japan, and Java in 1901–02. In 1912 he was appointed chairman of the Federal Horticultural Board to attend to the enforcement of the plant quarantine law to prevent the importation of diseased plants into the United States, a law which he had helped to secure. Marlatt was president of the Entomological Society of Washington in 1897–98 and of the Association of Economic Entomologists in 1899. His publications are for the most part official reports and bulletins.

MARLBOROUGH, märlʹbe-rŭ. An old and interesting town in Wiltshire, England, pleasantly situated in the valley of the Kennet, 75 miles west of London (Map: England, E 5). It is located in the midst of chalk hills known as the Marlborough Downs. The chief edifice is the "college" (founded in 1843), a handsome building occupying the site of an old castle built by Henry I. In this a Parliament, whose enactments were called the Statutes of Marlbridge, was held during the reign of Henry III. The town corporation dates from 1200. It owns remunerative real estate and a water supply and maintains an isolation hospital and sewage farm. Its products include cordage, leather, and malt. Pop., 1901, 3046; 1911, 4401.

MARLBOROUGH, märlʹbŭr-ō. A city, in-

cluding several villages in Middlesex Co., Mass., 28 miles west of Boston, on the Boston and Maine and the New York, New Haven, and Hartford railroads (Map: Massachusetts, D 3). Among the features of Marlborough are a handsome city hall, public library, high-school building, post office, hospital, and a soldiers' monument. There are extensive boot and shoe, box, and carriage factories, miner's lamp works, and manufactories of shoemaking machinery. The government is vested in a mayor, annually elected, a bicameral council, and administrative departments. The members of the license department are appointed by the mayor; of the police, fire, and street departments, by the mayor with the consent of the council; while the members of the water, health, and poor departments are elected by the council. The water works are owned by the city. Pop., 1890, 13,805; 1900, 13,609; 1910, 14,579; 1914, 14,991; 1920, 15,028. Settled in 1656, Marlborough was incorporated as a town in 1660 and was chartered as a city in 1890. In 1676, during King Philip's War, it was almost wholly destroyed by the Indians. Out of the parts of the original township Westborough was formed in 1717, Southborough in 1727, and Hudson in 1866. Consult Hudson, *History of the Town of Marlboro, Massachusetts* (Boston, 1862), and E. A. Bigelow, *Historical Reminiscences of the Early Times in Marlborough, Massachusetts, and Prominent Events from 1860 to 1910* (Marlborough, 1910).

MARLBOROUGH. The northeastern district of South Island, New Zealand (Map: New Zealand, South Island, D 2). Area, 4325 square miles, of which about 100 square miles are devoted to farming and 2625 to sheep grazing. It has a large business in dairy products; much timber is cut. Coal, gold, and copper are found in the district. Pop., 1906, 14,368.

MARLBOROUGH, Duchess of. See Jennings, Sarah.

MARLBOROUGH, John Churchill, first Duke of (1650–1722). A celebrated English general. He was born probably June 24, 1650, at Ashe in the Parish of Musbury, Devonshire, the second son of Sir Winston Churchill, a politician and historian and a stanch supporter of the Stuarts. John Churchill was educated at St. Paul's School, but early in life entered the army. He saw some service at Tangier against the Moors, and from 1672 to 1677 he bore arms on the Continent against the Netherlands, serving part of the time under the great Turenne. A new era in the history of war was then beginning. Artillery and musketry had displaced entirely the old pikeman, and rapidity of movement henceforth decided campaigns. In 1674 Louis XIV made Churchill a colonel of his regiment, and in 1678 he was made colonel of foot in the English service. Though there was no question of Churchill's ability, still the rapidity of his promotion was due also to the fact that some time between 1665 and 1668 his sister Arabella had become the mistress of the Duke of York. About 1676 Churchill fell in love with Sarah Jennings (q.v.), who was a lady in waiting of Princess Anne (later Queen Anne), and noted for her imperiousness and her beauty. The couple were married early in 1678, and thus Churchill gained the favor of Princess Anne, who was under the complete domination of her dictatorial attendant. In the following years he was occasionally employed in diplomatic missions to Holland, but usually he was in attendance on the Duke of York. In 1682 he was created Baron. When in 1685 the Duke of York ascended the throne as James II, Churchill became still more prominent. He commanded a body of troops to suppress the rebellion of the Duke of Monmouth (q.v.), and his coolness prevented a serious disaster to the royal troops at Sedgemoor (q.v.). Churchill was strongly attached to the English church, and his eulogists have maintained that he would not have betrayed it under any circumstances. This may be doubted, but he certainly did not desert the cause of the Church when he noticed the current of public opinion turning more and more against King James. The result was that he withdrew gradually from participation in the acts of this reign, and, though still affecting loyalty to the King, he began negotiations with William of Orange, and when the latter landed in England in 1688 Churchill was one of the first to go over to him with his troops. During the early part of the reign of William III he was in high favor; in 1689 was made Earl of Marlborough, and distinguished himself greatly during the invasion of Ireland, but lost all favor when he was suspected, and justly so, of preparing to betray William III and aid James II to recover the throne, of which he had helped to deprive him. Nevertheless, on the commencement of the War of the Spanish Succession in 1701 Marlborough was intrusted by William III with the command of the British army in the Netherlands. On March 8, 1702, however, the King died.

With the accession of Anne began the great epoch of Marlborough's life. Through his wife he controlled the Queen, while the son of the powerful minister Godolphin (q.v.) had in 1698 married his daughter. Thus he had a fairly free hand to carry out his great military exploits, though the allies, Dutch and Germans, often caused difficulties. The troops of the Emperor Leopold I were commanded by the great Prince Eugene (q.v.). Marlborough, who had been elected also captain general of the Dutch forces, took command in May, 1702, and in December was created Duke of Marlborough. He had under him about 10,000 English troops, 20,000 Dutch troops, and as many mercenaries, chiefly Germans. He was opposed by a French army of 75,000 men. The great danger to the allies was that the French would control the Rhine valley and thus completely isolate Austria. In order to prevent this Marlborough, who had been conducting a series of brilliant operations in the Low Countries, in the summer of 1704 made a rapid march to Bavaria and, having joined Prince Eugene, met the French on equal terms at Blenheim (q.v.) on Aug. 13, 1704. The battle was decided when Marlborough, by a skillful use of his cavalry, broke through the French centre and the enemy retired in great confusion. In this series of operations, instead of the old method of detailed operations and sieges, the two great leaders had concentrated all their forces in the important territory, and there by one decisive victory had won the whole campaign. Not the whole credit of the successes of the allies is due to Marlborough, a full half belonging to Eugene. For this victory great honors and pecuniary rewards were bestowed on Marlborough and he was made a Prince of the Empire (Austria). (See Blenheim House.) He won other important victories during the war, as when he compelled the

French under Villeroi to evacuate the whole of Flanders by his victory at Ramillies on May 23, 1706, and, together with Eugene, defeated Vendôme at Oudenarde on July 11, 1708. By this last victory and the capture of Lille the road to Paris was opened, but Marlborough had no longer a free hand. His wife had had several quarrels with Anne, and the Queen was ridding herself of the complete ascendancy of the Duchess. Moreover, England was suffering from the burdens imposed by the long struggle, and the Tories, who opposed the war, were coming into power. On Sept. 11, 1709, Marlborough and Eugene won a doubtful victory at Malplaquet, but it was the last great battle of the English general. The same year the Duchess was dismissed by Anne, a Tory ministry assumed office, and in 1711 Marlborough was relieved of his command. His enemies accused him of having embezzled the public money, and for a time he was deprived of his offices, though the charge was not pressed. In his last years he was without influence or friends, being, in spite of his victories, unpopular on account of his avarice. Godolphin had died and most of the great lords were his enemies. Upon the accession of George I in 1714 he was made captain general and master of the ordnance, but took little part in public affairs. He died June 16, 1722, leaving a large fortune.

Marlborough has often been severely treated by historians. He was unquestionably unscrupulous and avaricious. On the other hand, it was a time when this was true of nearly all public men, regardless of party, and Marlborough has received more blame simply because he was more prominent. His military abilities, however, have never been questioned. Unlike his two great successors, Frederick the Great and Napoleon, he was never entirely unhampered. He was always compelled to have regard for the wishes of his allies and the political situation in England. But he was the first since classic times to impress upon generals the need of rapidity of movement and the execution of campaigns as a whole. Moreover, he had the ability, which only the greatest commanders have, to amalgamate the different elements of his army, to become the hero of his soldiers. His campaigns always showed a grasp of the proportion of things. He never frittered his strength away on details, but waited for the decisive battle. Among generals, he is one of the very few who never lost a battle, and never failed in a campaign.

Bibliography. Sir George Murray, *Private Correspondence of the Duke and Duchess of Marlborough* (2 vols., London, 1838); id., *Letters and Dispatches of John, Duke of Marlborough, from 1702 to 1712* (5 vols., ib., 1845); id., *Letters of the Duchess of Marlborough* (ib., 1875). The most complete life is that of William Coxe, *Memoirs of the Duke of Marlborough* (3 vols., London, 1847–48), but it is too partial to Marlborough. A bitter attack on Marlborough is in Macaulay's *History;* while an impartial character-study is to be found in G. E. B. Saintsbury, *Marlborough* (London, 1879). For the military history of Marlborough, and an estimate of him as a general, consult: T. A. Dodge, *Gustavus Adolphus and the Development of the Art of War* (Boston, 1895); Sir Archibald Alison, *Military Life of the Duke of Marlborough* (ib., 1879); F. W. O. Maycock, *An Outline of Marlborough's Campaigns* (New York, 1913); S. J. Reid, *John and Sarah, Duke and Duchess of Marlborough, 1660–1744* (ib., 1914); also general histories like J. R. Green, *History of the English People* (8 vols., New York, 1905–08).

MARLBOROUGH HOUSE. A mansion on the south side of Pall Mall, London, erected in 1710 by Sir Christopher Wren for the first Duke of Marlborough. It was bought by the government in 1817. In it Princess Charlotte and her husband, Prince Leopold, and subsequently the Queen Dowager Adelaide, lived. In 1863 it became the property and city residence of the Prince of Wales.

MAR'LIN. A city and the county seat of Falls Co., Tex., 28 miles southeast of Waco; on the Houston and Texas Central and the International and Great Northern railroads (Map: Texas, D 4). It is in a noted cotton-growing district and carries on an important trade in cotton, grain, and live stock. Among the industrial plants are several cotton gins, a cotton compress, a large cottonseed-oil mill, and brick and marble works. As a health resort, Marlin has considerable reputation, derived from its hot artesian wells, 3350 feet deep, the waters of which have a temperature of 147° F. and possess valuable medicinal properties. There are fine hotels and sanatoriums, a courthouse, and an opera house. The water works are owned by the city. Pop., 1900, 3092; 1910, 3878.

MARLIN. A godwit (q.v.).

MARLINESPIKE (from *marline,* from Dutch *marlijn,* from *marren,* to bind, Goth. *marzjan,* OHG. *marrjan,* dialectic Ger. *merren,* to retard, hinder, Eng. *mar* + *lijn,* Eng. *line*), MARLINSPIKE, or MARLINGSPIKE. A pointed iron instrument, used by sailors in knotting, splicing, etc. It is generally 8 to 12 inches long, about an inch in diameter at the head and tapering to a point at the other end. Its chief use is in separating the strands of rope or in opening out a knot which is jammed so tightly that it cannot be untied otherwise. In marling and in serving it is used as a heaver to haul the turns taut. A large wooden instrument of the same general shape is termed a *fid.* See KNOTTING AND SPLICING.

MARLINSPIKE. The New England name for the boatswain or boatswain bird (q.v.).

MAR'LITT, E., the pseudonym of EUGENIE JOHN (1825–87). A popular German novelist, born at Arnstadt. Her father was a portrait painter; her patroness was the Princess of Schwarzburg-Sondershausen, who sent her to Vienna to study music. She became deaf, lived for 11 years at court, and then, withdrawing to Arnstadt, began there her novelistic career. *Die zwölf Apostel* (1865), *Goldelse* (1868), *Das Geheimnis der alten Mamsell* (1868), *Thüringer Erzählungen* (1869), *Reichsgräfin Gisela* (1870), *Heideprinzesschen* (1872), *Die zweite Frau* (1874), and other novels are familiar in English translations. They have little literary value. Her collected works appeared in 10 vols. (Leipzig, 1888–90; 2d ed., 1891–94).

MAR'LOW, or GREAT MARLOW. A municipal borough and market town in Buckinghamshire, England, on the north bank of the Thames, 32 miles west of London (Map: England, F 5). It is a much frequented fishing resort. Here Shelley wrote the *Revolt of Islam* in 1817. It has manufactures of silk, lace, paper, and furniture. Pop. (urban district), 1901, 4526; 1911, 4683.

MARLOWE, mär'lō, Christopher (1564–93). A great English dramatist, the most important of Shakespeare's predecessors, and in some sense his master. The son of a shoemaker, he was born at Canterbury probably in February, 1564, and was educated at the King's School, Canterbury, and at Corpus Christi College, Cambridge, where he graduated in 1583, and took his M.A. in 1587. Here he made a thorough acquaintance with the Latin classics, and translated Ovid's *Amores* into English verse. His life after leaving Cambridge is hard to trace in detail. It seems to have been spent chiefly in London and to have been characterized by a revolt against conventional morality and established religion. His career ended untimely and unhappily: it was his misfortune to be killed in a drunken brawl at Deptford. Of the blasphemy and gross immorality that have often been ascribed to him he was probably not guilty. However, upon his reputation for heresy and irreligion (possibly grounded originally on his association with his old Cambridge tutor, Francis Kett, who was burned as a heretic at Norwich in 1589), was based a warrant for his arrest issued a few days before death removed him from the jurisdiction of the Privy Council. It is pleasanter to dwell on his intercourse with the chief men of letters in his time, including Kyd, Nash, Greene, Chapman, Raleigh, and probably Shakespeare. Whatever his life may have been, there can be no question of the magnificence of his genius and the far-reaching influence which he had upon the development of the English drama.

Not only did he establish the iambic pentameter as the recognized vehicle for serious drama, but he made it something more than it had been in various experiments since *Gorboduc* (1562). The metre became a living thing in his hand; by skillful variation of pause and accent, by the swift and smooth carrying along of the thought from line to line, it grew to be that blank verse which Milton perfected into one of the glories of English poetry. But his work was wider than this. Dropping the imitation of Seneca which had been trying to naturalize itself in England, he struck out boldly to create English tragedy by the laws of his own genius. The prologue to *Tamburlaine* contains what is really a manifesto, not only promising to lead his audience away

From jigging veins of rhyming mother-wits

by his blank verse, but proclaiming a doctrine of unity far more healthful than the classical tradition which was endeavoring to impose itself upon England—the unity which comes from centring the action about one great passion, one mighty character. Great as was the age, stupendous as were its flights beyond what had been thought the uttermost limits of the possible, Marlowe is able to keep up with them, to find for them the "high astounding terms" which lend his tragedies such sublimity. In humor he was deficient; his touch is not always sure, and in his search for effect he sometimes overleaps himself and falls into bathos; but as a daring pioneer he won, and now more than ever, since Lamb and Hazlitt restored him to his place, keeps a rank among the very highest. It is hard to set limits to what he might have been had his life been prolonged; but after all his achievement is ample in that he made Shakespeare possible. After *Tamburlaine* (?1587; printed 1590), comes probably the first dramatic rendering of the Faust legend in *Doctor Faustus* (?1589; printed 1604); *The Jew of Malta*, specially noteworthy for its relation to the *Merchant of Venice* (?1589; printed 1633); his most successful attempt at English historical drama, *Edward II* (?1592; first published 1594). The probable sources of Marlowe's important plays may be indicated here. In his *Tamburlaine* he seems to have relied mainly on Fortescue's translation (1571) of Pedro Mexias's Spanish life of Timur (1543), supplemented by hints from the *Vita Magni Tamerlanis* of Perondino (1551). *Doctor Faustus* was based on a story familiar enough in the Middle Ages, and used in a variant form by Calderon in *El Magico Prodigioso;* its earliest literary form appeared at Frankfort in 1587. For *Edward II*, like Shakespeare, he makes free use of the chronicles of Stowe and Holinshed. In other words he collaborated with Nash, and possibly with Shakespeare, a share in at least the second and third parts of *Henry VI* being plausibly attributed to him. Of his nondramatic work the most important things are his unfinished paraphrase of the *Hero and Leander* of Musæus, and the famous lyric, "Come live with me and be my love." Consult his *Works*, ed. by Alexander Dyce (3 vols., London, 1850); by A. H. Bullen (3 vols., Boston, 1885); four plays, ed. by Ellis, with an introduction by J. A. Symonds, in the "Mermaid Series" (London, 1887); also A. W. Verity, *Influence of Christopher Marlowe on Shakspere's Earlier Style* (London, 1886); Fischer, *Zur Characteristik der Dramen Marlowes* (Munich, 1889); J. G. Lewis, *Christopher Marlowe* (London, 1891); A. W. Ward, *History of English Dramatic Literature to the Death of Queen Anne* (New York, 1889); J. A. Symonds, *Shakspere's Predecessors in the English Drama* (London, 1900); Seccombe and Allen, *Age of Shakespeare*, vol. ii (3d ed., ib., 1909); Swinburne's *Marlowe* (conveniently accessible in New York, 1908 ed.); G. E. Woodberry, "Marlowe," in *The Inspiration of Poetry* (New York, 1911); W. L. Phelps, in *Essays on Books* (ib., 1914); and the exhaustive article by Sidney Lee in the *Dictionary of National Biography*, vol. xxxvi (London, 1893).

MARLOWE, Julia (1870–). An American actress, born near Keswick, England, Aug. 17, 1870, her real name being Sarah Frances Frost. She came with her parents to America when five years old. Her later childhood was passed in Cincinnati, where at the age of 12 she had her first dramatic experience in a juvenile opera company. Four years afterward she began seriously to study for the stage, and in 1887 she appeared in New York, but it was in Boston, in December, 1888, that she won, as Parthenia in *Ingomar*, an assured place as a star. An actress of unusual personal charm, she soon became a popular favorite in a variety of rôles, especially as Viola in *Twelfth Night* and as Rosalind in *As You Like It*. In 1894 she was married to Robert Taber, with whom for a time she played, but they separated, and in 1899 were divorced. In 1913 she married E. H. Sothern, whose associate she had been almost continuously since 1904. Among Miss Marlowe's successes may be mentioned her Highland Mary in *For Bonnie Prince Charlie* (1897); Barbara Frietchie in Clyde Fitch's play of that name (1899); and Charlotte Durand in the dramatization of Cable's *Cavalier* (1902); *Colin-*

ette (1903); *Queen Fiametta*, and *When Knighthood was in Flower* (1904). In the autumn of 1904 she began a co-star engagement with E. H. Sothern, under the management of Charles Frohman, appearing chiefly in Shakespearean plays. She met with unusual success in the rôles of Juliet, Rosalind, Beatrice, Portia, and Katherine in *The Taming of the Shrew*. Subsequently she appeared at various times in modern plays, but with no great success, and she came to confine herself almost entirely to Shakespearean parts. At the opening of the Century Theatre in New York, 1909, she appeared with E. H. Sothern in a production of *Antony and Cleopatra*. From 1910 to 1914, with her husband, she toured most successfully in Shakespearean repertoire, annually appearing for a season in New York. Indeed, both in artistic worth and in popularity, the Sothern and Marlowe productions of Shakespeare were the most notable of their time. Consult: McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896); L. C. Strang, *Famous Actresses of the Day in America* (Boston, 1899); William Winter, in *Wallet of Time*, vol. ii (New York, 1913).

MAR'MADUKE, JOHN SAPPINGTON (1833–87). An American soldier, born near Arrow Rock, Mo. After studying at Yale and Harvard, he entered West Point and graduated there in 1857. In 1858–59 he saw service in the West, participating in the Utah expedition to subdue the Mormons, who were rebelling against the United States government. In 1861 he entered the Confederate army as first lieutenant, though almost immediately promoted to be lieutenant colonel. In 1862 as colonel of an Arkansas regiment he bore the guiding colors at Shiloh and captured the first prisoners. He was seriously wounded on the second day, and while recovering was recommended for promotion to brigadier general. During 1863 he was in Missouri and defeated the Federal forces at Taylor's Creek. He commanded the cavalry at Price's defense of Little Rock and here fought a duel, killing Gen. L. M. Walker. The next year he was promoted to be major general and led one of the three columns in General Price's Missouri raid, was taken a prisoner of war, and was held until August, 1865. He afterward engaged in the commission and insurance business (1866–71) and from 1871 to 1874 was editor successively of *The Journal of Commerce*, St. Louis *Evening Journal*, and *The Illustrated Journal of Agriculture*. He was secretary of the State Board of Agriculture in 1874. From 1875 to 1880 he was a railroad commissioner. In 1884 he was elected Governor of Missouri and died in office.

MARMANDE, mär'mänd'. The capital of an arrondissement in the Department of Lot-et-Garonne, France, on the Garonne River, 40 miles southeast of Bordeaux (Map: France, S., E 4). Its parish church is an interesting thirteenth-century Gothic edifice. Marmande has a communal college, schools of commerce and agriculture, and manufactures rope, cloth, canvas, and hats. It is situated in a region extensively engaged in agriculture and the cultivation of the vine. Pop. (commune), 1901, 9873; 1911, 9832.

MÁRMAROS-SZIGET, mär'mŏ-rŏsh sĭ'gĕt, or MÁRAMAROS-SZIGET. The capital of the County of Mármaros, Hungary, beautifully situated on the Theiss and at the base of the wooded Carpathians, 232 miles east-northeast of Budapest (Map: Austria-Hungary, H 3). Its institutions include a school of law, a Roman Catholic and a Reformed Gymnasium, and a teachers' seminary. It has important salt mines worked from ancient times which still have a large output. It also produces lumber, spirits, and vinegar. Pop., 1900, 17,445; 1910, 21,370.

MARMETTE, mär'mĕt', JOSEPH (1844–95). A Canadian novelist. He was born in Montmagny, Quebec, and early devoted himself to a literary career, choosing the historical novel as a medium for bringing before the French-Canadians the stirring incidents of their history. He published: *Charles et Eva* (1867); *François de Bienville* (1870), portraying the unsuccessful siege of Quebec by Sir William Phips in 1690; *L'Intendant Bigot* (1872), a description of the closing years of French rule in Canada; *Le Chevalier de Mornac* (1873); and *Le tomahawk et l'épée* (1877).

MARMIER, mär'myā', XAVIER (1809–92). A French author, born in Pontarlier. He traveled extensively in Switzerland, Holland, and Germany. In 1835 he was attached to the scientific voyage of the *Recherche* to the Arctic Sea, at which time he acquired a knowledge of the Danish, Swedish, and Finnish languages. On his return in 1839 he was made professor of foreign literature at Rennes, and two years later received a sinecure under the Minister of Public Instruction. In 1842–49 he was again traveling, everywhere studying languages, idioms, and literature. His numerous works include narratives of his journeys and translations from the German and Scandinavian, such as *Histoire de la littérature en Danemark et en Suède* (1839); *Du Rhin au Nil* (1846); *Voyage pittoresque en Allemagne* (1858–59); *Cimarosa* (1867); and *Contes russes* (1889). Consult the *Life* by Estignard (1893).

MAR'MION. A metrical romance by Sir Walter Scott (1808).

MARMION, SHACKERLEY (1603–39). An English dramatist, educated at Wadham College, Oxford, where he graduated B.A. in 1622 and M.A. in 1624. After trying his fortune in the Low Countries, he settled in London, where he lived somewhat riotously, and was at one time arrested for stabbing a man in a brawl. There he became associated with Ben Jonson, Heywood, and other literary men. He accompanied Sir John Suckling on the showy expedition to Scotland (1638). Falling ill at York, he was brought back to London to die. Marmion made a verse paraphrase of the *Cupid and Psyche* of Apuleius (1637), which was greatly admired by his contemporaries. It was reprinted by S. W. Singer in 1820. For the court, Marmion wrote several comedies, which are still interesting. They comprise *Hollands Leaguer* (performed 1632); *A Fine Companion* (printed 1633); *The Antiquary* (performed 1636). Consult his *Dramatic Works*, ed. by Maidment and Logan (Edinburgh, 1875).

MÁRMOL, mär'môl, JOSÉ (c.1818–71). An Argentine poet and patriot, born at Buenos Aires. As Deputy and Senator for his native province, he took so firm a stand for the rights of the people that he was banished by Rosas. After the overthrow of the dictator Mármol was again Senator for Buenos Aires and had charge of the National Library until he lost his eyesight. He published a drama *El poeta* (1842); *El Peregrino* (1846); *El Cruzado*, a drama (1851); *Armonías* (1851); *Poesías* (2d ed., 1854); and an historical novel, *Amalia* (1855).

This last is the work by which Mármol is most widely known both at home and abroad, having been translated into French and German. After his death some of his poems and dramas were collected and published by his biographer, José Domingo Cortés, under the title *Obras poéticas y dramáticas de José Mármol* (Paris, 1875).

MARMONT, mär'môn', Auguste Frédéric Louis Viesse de, Duke of Ragusa (1774–1852). A marshal of France, born July 20, 1774, at Châtillon-sur-Seine. He entered the French army in 1791 and was rapidly promoted. He met Bonaparte at Toulon, served with distinction in the Italian campaign, particularly at Lodi and Castiglione, and later accompanied Bonaparte to Egypt, where he became brigadier general. On returning to France Marmont supported Napoleon in the coup d'état of the eighteenth Brumaire, and afterward continued in active military service. After the battle of Marengo (1800) he was made a general of division. In 1801 he was inspector general in chief of artillery, and in 1805 he was made commandant of the army in Holland. His services in defending the Ragusan territory against the Russians and Montenegrins in 1806–07 won him his title of Duke of Ragusa. After the battle of Wagram (1809) he was intrusted with the pursuit of the enemy, and after the battle of Znaim he was made a marshal. He was thereafter for 18 months Governor of the Illyrian provinces, and in 1811 succeeded Masséna in the chief command in the Peninsula, where he assumed the offensive, and kept Wellington in check for 15 months, but was eventually defeated in the battle of Salamanca (July 22, 1812). A wound compelled him to retire to France. In 1813 he fought at the battles of Lützen, Bautzen, and Dresden. He maintained the contest with great spirit in France in the beginning of 1814; and it was not until further resistance was hopeless that he concluded a truce with Prince Schwarzenberg, which was followed by the abdication of Napoleon. The Bourbons at first loaded Marmont with honors and distinction. On the return of Napoleon from Elba Marmont was excluded from the general amnesty, and he fled to Aix-la-Chapelle. After the second Restoration he spent much of his time in agricultural pursuits, till the revolution of 1830, when, at the head of a body of troops, he attempted in vain to put down the insurrection, and finally retreating with 6000 Swiss, and a few battalions that had continued faithful to Charles X, conducted him across the frontier. From that time he resided chiefly in Vienna. He died in Venice, March 2, 1852. He was the last survivor of the marshals of the first French Empire. His *Mémoires* (9 vols., 1856–57) are valuable for the history of his time. He was also the author of *Voyage en Hongrie* (1837) and *Esprit des institutions militaires* (1845).

MARMONTEL, mär'môn'tĕl', Antoine François (1816–98). A French pianist, born at Clermont-Ferrand, Puy-de-Dôme. He studied in 1828–32 at the Paris Conservatory, where he returned to teach in 1836, and in 1848 succeeded his former master, Zimmermann, as pianoforte professor. He published three books of piano studies, besides sonatas, nocturnes, serenades, minuets, reveries, and mazurkas, and his literary productions are: *Art classique et moderne du piano* (1876); *Eléments d'esthétique musicale et considérations sur le beau dans les arts* (1884); and *Histoire du piano et de ses origines* (1885).

MARMONTEL, Jean François (1723–99). A French dramatist, novelist, and critic, born at Bort, July 11, 1723, best known for two series of *Contes moraux* (1761–86), and the moralizing novels *Bélisaire* (1767) and *Les Incas* (1777). He studied for the church, but was attracted to letters by the patronage of Voltaire, went to Paris (1745), became a journalist, and won some success by his tragedies: *Denys le tyran* (1748) and *Aristomène* (1749). In 1753 a sinecure office attached him to the court at Versailles. During 1758 and 1759 he edited the *Mercure.* He was imprisoned 10 days in the Bastille for political satire in 1760, was elected to the Academy in 1763, and made its permanent secretary in 1783. His numerous contributions to the *Encyclopédie* (see Diderot) were collected as *Eléments de littérature* in 1787. He wrote also *Mémoires* and a treatise on French versification (1763). Marmontel's *Works* were edited by himself in 17 volumes, to which 14 were subsequently added. They were reëdited by Villeneuve (Paris, 1819–20). The *Mémoires* are best edited by Tourneux (Paris, 1891). There was an English translation in 1904. Consult C. A. Sainte-Beuve, *Causeries du lundi,* vol. iv (Paris, 1857–62), and S. Lenel, *Marmontel, un homme de lettres au XVIIIe siècle* (ib., 1902).

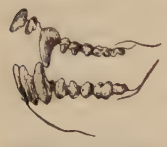
MARMORA, La. See La Marmora.

MARMORA, mär'mô-râ, Sea of (anciently Propontis). A small sea between European and Asiatic Turkey, communicating with the Ægean Sea by the Strait of the Dardanelles (anciently Hellespont), and with the Black Sea by the Bosporus (Map: Balkan Peninsula, G 4). It is of an oval form, 140 miles in length by 45 miles in breadth, and the east shore is indented by the two large gulfs of Ismid and Injir Liman (Mudania). The depth is generally over 600 feet, and in some places reaches over 4000. There is a current running through it from the Black Sea to the Ægean. Its navigation is not difficult and it is a great avenue of commerce. It contains many islands, of which the largest is Marmora or Marmara, famous for its white marble quarries, which supplied the materials for several famous buildings of antiquity. During the European War which broke out in 1914, the Sea of Marmora was of great military importance. The only practical means of getting munitions of war into Russia and of getting supplies of grain, etc., from Russia was closed on account of the belligerency of Turkey. To open up this highway of commerce a great allied fleet attacked the Dardanelles simultaneously with a Russian naval attack on the Bosporus. See War in Europe.

MARMOR LUNENSE. See Carrara; Luna.

MARMOSET, mär'mô-zĕt (OF. *marmoset, marmouset,* Fr. *marmouset,* puppet, from ML. *marmoretum,* marble figure, from Lat. *marmor,* Gk. *μάρμαρος, marmaros,* marble, from *μαρμαίρειν, marmairein,* to sparkle). One of the small and pretty American monkeys formerly considered to be comprised in two genera (*Hapale* and *Midas*) of the family Hapalidæ. These little creatures are distinguished from all other American monkeys by several features besides their diminutive size, long hind legs, long fur, and penciled ears. Their dentition is like that of the Old World monkeys in that it comprises only 32 teeth, without the four "wisdom" molars possessed by the Cebidæ. (See Monkey.) Their thumbs are not opposable, their nails are in the

form of claws, and their tails (which are long and bushy) are not prehensile. These and other characters place them at the foot of the scale of the monkeys, and next to the lemurs. They are arboreal in habits and climb about in small parties in search of fruit and insects, much as squirrels do; and they habitually produce two or three young at a birth instead of one, as is usual with higher monkeys. Elliot in his *Review of the Primates* groups the tamarins and marmosets in the family Callitrichidæ, dividing this into six genera, *Seniocebus*, *Cercopithecus*, *Leontocebus*, *Œdiponidas*, *Callithrix*, and *Callicebus*. He recognizes about 65 forms. The common ouistiti (*Hapale*, or *Callithrix*, *jacchus*) of Brazil is a familiar pet throughout tropical America, and is often brought to the United States or taken to Europe, but rarely survives even the first northern winter. It is not larger than a half-grown kitten, and is usually blackish, with the back and thighs banded with gray, and two great tufts of hair on the ears pure white; the tail is ringed with black and gray. Several other species and varieties are known, some of which are vari-colored and others pure white. The smallest, and one of the most widely distributed, is only 7 inches long.



DENTITION OF THE MARMOSETS.

The tamarins, or silky marmosets, differ in dentition and also in the absence of tufts on the ears and the rings of color on the tail. Like the others, they are common pets in South and Central America, and some kinds stray as far north as central Mexico. Several species are well known, especially the negro tamarin (*Midas*, or *Cercopithecus*, *ursulus*) of the lower Amazon valley; the queer little pinché (*Midas*, or *Œdipomidas*, *œdipus*) of the Isthmus, which has a great growth of white hair on the head; and the silky marmoset, or marikina (*Midas*, or *Leontocefus*, *rosalia*), which is clothed in long silky hair of a golden hue; this hair forms a long mane on the head and neck, giving the name lion monkey to some varieties. This species is often seen in menageries, and is a common pet in its own country. Consult authorities mentioned under MONKEY; especially H. W. Bates, *A Naturalist on the River Amazons* (London, 1910). See Plate of AMERICAN MONKEYS.

MAR'MOT (Fr. *marmotte*, from It. *marmotta*, *marmontana*, from Rumanian *murmont*, from OHG. *murmunto*, Ger. *Murmel*, from ML. *mus montanus*, mountain mouse, marmot). A name given to rodents of the ground-squirrel family. They resemble squirrels in their dentition, although in their form and habits they more resemble rats and mice. The animal to which the term (now little used) was first applied was the common marmot (*Arctomys alpinus*, or, as it is now known, *Marmota marmota*) of the mountains of Europe. It is about the size of a rabbit, grayish yellow, brown towards the head. It feeds on roots, leaves, insects, and the like, is gregarious, and often lives in large societies. It digs large burrows with several chambers and two entrances, generally on the slopes of the mountains, where the marmots may be seen sporting and basking in the sunshine during the fine weather of summer. They spend the winter in their burrows, in one chamber of which is a store of dried grass; but the greater part of the winter is passed in torpidity. The alpine marmot is easily tamed. These features and habits are characteristic of the group. A half-dozen other species occur in Europe, Asia, and North America. The best-known American species are the woodchuck and its larger relative of the Rocky Mountains. See WHISTLER; WOODCHUCK; and Plate of GOPHERS, LEMMINGS, and MARMOTS.

MARMOUSETS, mär'mōō'zā' (Fr., little men). A name given in contempt to the councilors of Charles VI of France (q.v.). They were for the most part members of the lesser nobility or of the citizen class and were despised by his uncles, who had governed the kingdom during the minority of Charles. Consult Ernest Lavisse, *Histoire de France*, vol. iv, part i (Paris, 1902).

MARNE, märn (Lat. *Matrona*). A river of France, the principal tributary of the Seine (Map: France, N., J 3). It rises in the Plateau of Langres, flows first northwest, then westward, with many windings through the departments of Haute-Marne, Marne, Aisne, and Seine-et-Marne, passes Chaumont, Saint-Dizier, Châlons, Epernay, and Meaux, and joins the Seine at Charenton, about 4 miles above Paris. Its length is 325 miles, and it is navigable for 226 miles to Saint-Dizier. It is a rather rapid stream, supplying power to a number of mills. It is paralleled in the upper reaches by lateral canals and its large traffic has been extended by means of canals, of which the most important is the Marne-Rhine Canal, which extends 195 miles from Vitry to Strassburg, passing through several tunnels. The great offensive movement of the Germans through France during the European War which began in 1914 received a final check at this stream, resulting in the series of very severe engagements lasting several days and known collectively as the battle of the Marne. See WAR IN EUROPE.

MARNE. An inland department in the northeast of France, part of the old Province of Champagne, extending southward from the frontier department of Ardennes (Map: France, N., J 4). Area, 3168 square miles. The department is traversed by the Marne River and a small portion of the Seine and Aisne. The soil is very fertile in the south, producing oats, wheat, rye, and barley, but chalky and arid in the north; on this dry and chalky soil, however, the best grapes for champagne wine are grown, especially in the neighborhood of Epernay and Avize and between the Marne and the Vesle. Cotton, metal, and woolen manufactures are largely carried on, also sheep raising and bee culture. There are large iron and copper foundries, blast furnaces, and machine works. Capital, Châlons-sur-Marne; important towns are Rheims and Epernay. Pop., 1891, 434,734; 1901, 432,882; 1911, 436,310.

MARNE, HAUTE. A department of France. See HAUTE-MARNE.

MAR'NIAN EPOCH. The name applied to the second Iron Age, or culture stage of Europe. It is so called from the Department of Marne, in northeastern France; also termed La Tène Period, from a station of that name in Switzerland. It lasted until the first century B.C. in France, Bohemia, and England, and until the tenth century A.D. in Scandinavia. It corresponds with the late Celtic of English archæologists. See NEOLITHIC PERIOD.

MARNIX, mär'nīks, PHILIP VAN, BARON SAINTE-ALDEGONDE (1538–98). A Flemish

statesman and writer, born at Brussels. He studied theology under Calvin and Beza at Geneva and returned to his native country (1560) a devoted adherent of the Reformed religion and a sworn foe of the Spanish government and the Inquisition. Upon the appointment of the Duke of Alva to the governorship of the Netherlands (1567) Marnix sought refuge in Germany. He shared in the labors of William of Orange, who, in 1572, sent him as his representative to the first meeting of the Estates of Holland at Dordrecht. After a year's captivity in the hands of the Spaniards he entered upon an active diplomatic career as representative of the Protestant provinces at Paris and London, and in 1578 at the Diet of Worms. He took a prominent part in the formation of the Union of Utrecht. (See NETHERLANDS.) In 1583 he became burgomaster of Antwerp, and, after a 13 months' siege, was forced to surrender the city to Alexander of Parma (1585). Thereafter he took little share in political life. His writings in prose and verse form a part of the classic literature of the Netherlands. Of these the most important are: *De roomsche byenkorf* (1569), a satire; an excellent translation of the Psalms; and *Wilhelmus van Nassouwe*, which has become one of the national hymns of the Netherlands. His works were published at Brussels in seven volumes by Lacroix and Quinet (1855–59). Consult: E. Quinet, "Marnix de Sainte-Aldegonde," in *Œuvres complètes*, vol. v (Paris, 1857); *Cambridge Modern History*, vol. iii (Cambridge, 1904); A. Elkan, *Philipp Marnix von St. Aldegonde* (Leipzig, 1909).

MARNO, mär′nô, ERNST (1844–83). A German explorer of western Africa. He was born at Vienna and in 1866–67 went to Abyssinia. In 1869 he traveled to Khartum, then south to Fadasi, and in 1871 and 1872 explored the upper course of the White Nile. In 1874 he joined Gordon, who in 1878 put him in command of the District of Galabat, where he did much to suppress the slave trade. He died in Khartum. He wrote *Reisen im Gebiete des weissen und blauen Nil* (1874) and *Reise in der ägyptischen Aequatorialprovinz und in Kordofan in den Jahren 1874–76* (1878).

MAROBO′DUUS. See MARBO; MARCOMANNI.

MAROCCO, mȧ-rŏk′ō. See MOROCCO.

MAROCHETTI, mȧ′rō-kĕt′tē, CARLO, BARON (1805–67). An Italian sculptor. He was born at Turin, studied under Bosio and Gros, in Paris, and resided at Rome from 1822 to 1830. In 1827 he received a medal for his "Girl Playing with a Dog." His first important work was a statue of Emmanuel Philibert of Savoy at Turin, commissioned by Carlo Alberti of Sardinia, in recognition of which service he was made Baron. He subsequently returned to Paris. The most important of his works at Paris include: "Battle of Jemappes," a relief upon the Arc de Triomphe de l'Etoile; a monument to Bellini in Père-Lachaise Cemetery; and the marble group of the "Apotheosis of the Magdalen" on the high altar of the church of the Madeleine. In consequence of the revolution of 1848 he emigrated to England. His most important works there are an equestrian statue of Richard Cœur de Lion, which was cast in bronze by national subscription and is now near the entrance to the House of Lords, Westminster; equestrian statues of the Queen and of Wellington, for Glasgow; a portrait bust of Prince Albert; a statue of Lord Clyde in Waterloo Place and that of Thackeray in Westminster Abbey. He also modeled an equestrian statue of Washington for the New York Crystal Palace (since destroyed), a study of which is in the Metropolitan Museum of Art. His style is academic, but distinguished by some independence of treatment and skill in technique. He received the cross of the Legion of Honor in 1839 and was elected to the Royal Academy in 1866.

MARONI, mä′rō-nē′ (Dutch *Marowijne*). A river forming the boundary between Dutch and French Guiana (Map: Guiana, G 3). It rises in the Tumuc Humac Mountains on the frontier of Brazil and flows northward through a densely forested region, falling in a number of cascades over the successive escarpments of the terraced plateau. It enters the Atlantic after a course of 425 miles. Below the last cascade, 46 miles from its mouth, it is a wide, deep, and beautiful stream, connected with the estuary of the Surinam by the navigable Cottica Creek running parallel with the coast.

MAR′ONITES. A Christian sect of Syria, of very ancient origin. The most probable account represents them as descendants of a remnant of the Monothelite sect (see MONOTHELITISM), who, in the early part of the eighth century, settled on the slopes of the Lebanon, their chief seats being around the monastery of Maron, a saint of the fourth century, whose life is found in Theodoret's *Religious Histories* (iii, p. 1222). The emigrants are said to have elected as their chief and patriarch a monk of the same name, with the title of Patriarch of Antioch, and, throughout the political vicissitudes of the succeeding centuries, to have maintained themselves in a certain independence among the Moslem conquerors. In the twelfth century, on the establishment of the Latin Kingdom of Jerusalem, the Maronites abandoned their distinctive Monothelite opinions and recognized the authority of the Roman church. In 1445 they entered into a formal act of union with Rome. In 1584 a college was founded in Rome by Gregory XIII for the education of the Maronite clergy; and in 1736 they formally subscribed to the decrees of the Council of Trent. Nevertheless, although united with Rome, they are permitted to retain their distinctive national rites and usages. They administer communion in both kinds; they use the ancient Syriac language in their liturgy; their clergy, if married before ordination, are permitted to retain their wives; and they have many festivals and saints not recognized in the Roman calendar. The Maronites at present are about 300,000 in number. Their patriarch is still styled Patriarch of Antioch, and resides in the convent of Kanobin, in the heart of the Lebanon. He is chosen by the bishops subject to the approval of Rome, and always bears the name Butrus (Peter). Every tenth year he reports the state of his patriarchate to the Pope. Under him are 14 bishops, to whom are subject the officiating clergy of the smaller districts. The revenues of all orders of ecclesiastics, however, are very narrow, and the inferior clergy live in great measure by the labor of their hands. About 40 convents, including 15 nunneries, are to be found in the Lebanon, with about 2000 members, who wear a distinctive costume and follow the rule of St. Anthony. The chief seat of the Maronites is the district called Kesrowan, on the western declivity of Mount Lebanon; but they are to be found scattered over the whole territory of the Lebanon, and in all the towns

and larger villages towards the north in the direction of Aleppo, and southward as far as Nazareth. They have also spread to Cyprus and Egypt, to Europe, the French colonies, and America. Their political constitution is a kind of military republic, regulated for the most part by ancient usages and by unwritten but well-recognized laws. Like the Arabs of Syria, they have a political hierarchy, partly hereditary, partly elective. The chief administration is vested in four superior sheiks, who possess a sort of patriarchal authority, and under these are subordinate chiefs, with whom, as in the feudal system, the people hold a military tenure. They are bitter enemies of their neighbors, the Druses (q.v.). Their chief occupations are cattle raising and silk culture.

Bibliography. C. H. Churchill, *The Druzes and the Maronites under the Turkish Rule from 1840 to 1860* (London, 1862); Albert Socin, *Palästina und Syrien* (Leipzig, 1880); Koehler, *Die katholische Kirche der Morgenländer* (Darmstadt, 1886); Bliss, "Essays on the Sects of Syria and Palestine—the Maronites," in the *Palestine Exploration Fund Quarterly Statement* (London, 1892); F. N. Nau, *Opuscules Maronites* (2 vols., Paris, 1899–1900); F. J. Bliss, *The Religions of Modern Syria and Palestine* (New York, 1912).

MAROON (Fr. *marron*, chestnut, chestnut colored, from It. *marrone*, chestnut). A subdued crimson color, not so yellow as chestnut (marron), from which the name is probably derived, nor so brilliant as magenta.

MAROONS (Fr. marron, apocopated, from *simarron*, Spanish *cimarron*, fugitive, from *cima*, mountain top, twig, from Lat. *cyma*, Gk. κῦμα, *kyma*, sprout, from κύειν, *kyein*, to conceive). A name given in Jamaica and Dutch Guiana to runaway negro slaves. The term was first applied to those slaves who ran away and took refuge in the uplands when their Spanish masters were driven out by the British after the latter conquered Jamaica, in 1655. For 140 years they maintained a constant warfare with the British colonists; but in 1795 they were subdued and a portion of them removed to Nova Scotia, where they gave so much trouble that most of them were transported to Sierra Leone. The Maroons of Dutch Guiana still form a number of small independent communities practicing various pagan rites, some of which can be traced to analogous African ceremonies. They are now known more commonly as Bush negroes.

MAROS, mŏ′rŏsh. The principal river of eastern Hungary. It rises in the mountains of eastern Transylvania and flows westward, past Arad, emptying into the Theiss at Szegedin, after a course of 543 miles (Map: Hungary, G 3). It is navigable about two-thirds of its length to Karlsburg, but its navigation is impeded by the great irregularity of its volume. The conjunction of the floods of the Theiss and Maros destroyed Szegedin in 1879.

MAROS-NÉMETH (mä′rŏsh-nā′mĕt) **AND NADASKA,** Count von. See Gyulai, Franz.

MAROS-VÁSÁRHELY, vä′shär-hĕl-y′. A royal free town and capital of the County of Maros-Torda in Transylvania, Hungary, situated on the river Maros, 49 miles east-southeast of Klausenburg (Map: Hungary, J 3). It has a castle which is now used for barracks, and connected with which is a fifteenth-century Gothic church; the Teleki palace, with a fine library of over 70,000 volumes (including a manuscript of Tacitus) and a natural-history collection; a technical school for metal workers, a college with a library and printing press, two Gymnasia, and an industrial museum. There are several other notable Catholic churches, many fine buildings, a county hospital, and a museum. The industries of the town include the manufacture of sugar, tile, pottery, shoes, spirits, tobacco, beer, trimmed lumber, and the refining of petroleum. Pop., 1900, 19,522; 1910, 25,517, mostly Magyars.

MAROT, mȧ′rō′, Clément (1495–1544). A French poet, born at Cahors in Quercy between 1495 and 1497. He went to Paris with his father, the poet Jean Marot, about 1507, and began the study of law, which he early abandoned in favor of literature. In 1513 he became a page in the service of Nicholas de Neufville, the powerful lord of Villeroy, and two years later wrote his first original poem, the *Temple de Cupidon*, which was dedicated to the new King Francis I. This graceful allegory was inspired by the *Roman de la rose*, while its metrical form, though superior to contemporary works in its smoothness, was strongly influenced by the work of his predecessors, the school of the *rhétoriqueurs*. Thanks to this work, he became in 1518 *valet de chambre* of Marguerite d'Alençon, the future Queen of Navarre. Having entered the service of Francis I, he set out with the King on the ill-fated expedition to Pavia which resulted in the capture of the latter and the imprisonment of the poet in 1525. Marot was soon released, however, and returned to France. After this he is more original and less an imitator of Crétin, *souverain poète français*. Immediately after his return he was suspected of heresy and, in spite of a strong denial, was imprisoned in 1526, first in Paris and then less rigorously at Chartres. During his imprisonment he began his edition of the *Roman de la rose* and composed three of his best-known poems—the epistle to Bouchart protesting his innocence of the charge, his *Enfer*, and his famous letter to Lyon Jamet on the Lion and the Rat, from which La Fontaine drew his well-known fable. The King freed him on his return to France in 1526 and appointed him *valet de chambre* to succeed his father, Jean Marot, who died in 1527. In October of the same year he was again arrested for having attempted, while engaged in a prank, to save a comrade from the hands of the police. An amusing epistle to the King, in which the poet describes his efforts to bribe the state's attorney, won his release. In 1529 he composed an incomplete edition of his poetry which probably appeared during the course of the same year under the title *Adolescence Clémentine*, but of which the first edition extant is that of 1532. To this period belongs also the beautiful *Complainte, en forme d'églogue* on the death of the Queen mother Louise de Savoie (1531), which was imitated by Spenser in his *Shepherd's Calendar*. Suffering from the plague which devastated France in 1531, Marot wrote to the King his famous *Epistre pour avoir esté dérobé*, a masterpiece of its kind, in which the poet gives a very amusing account of how he was robbed by his *valet de Gascogne*. He now fell once more under suspicion of heresy, and withdrew to the court of Margaret at Nérac, where he probably occupied his time in preparing an edition of the poems of François Villon (q.v.), which he published at the end of the year 1533. The preface of this work is worthy

of note as containing the first warm appreciation of the works of the vagabond poet. After the affair of the placards he fled to Italy, taking refuge at the court of the Duchess of Ferrara, Renée de France. During his stay in Italy he began to compose his *blasons*, which were immediately imitated in France, becoming the source of an abundant literature. His epistles *Du Coq-à-l'âne*, of which he wrote several while at Ferrara, form the point of departure of a popular literary genre. Taking advantage of the truce of 1536, he returned to Lyons and was publicly obliged to abjure his heretical ideas. He was now to enjoy several years of court favor during which he composed his beautiful *Eglogue au roy sous les noms de Pan et Robin*, one of the few works of this period that reveal a feeling for nature. Immediately after his arrival he began his long quarrel with a former friend, François Sagon, in which nearly all the leading poets took part. Their contributions were collected in a volume, published in 1537, entitled *Plusieurs traictez par aucuns nouveaulx poètes du différend de Marot, Sagon et la Hueterie*. In 1539, with the help of the scholar Vatable, he commenced his poetical translation of the Psalms. At first they were well received and sung to popular tunes. But the Sorbonne took umbrage at such a procedure, and Marot was obliged to seek safety in flight. He went first to Geneva, where his Psalms were being sung in all the Protestant churches (1542). But he soon got into trouble with Calvin, and then went to Turin, where he died in the autumn of 1544. Marot is very important as a poet of transition. In his work we see the germ of the new school. He excels in the lighter vein, such as epigrams, epistles, fables, and songs, to which he has given his stamp. He was also one of the first to bring the sonnet and Italian elegy into France. His translation of the Psalms was completed by the Protestant leader Beza and is still used in French Protestant churches. In character he was a good-natured epicurean, having no desire for martyrdom.

Bibliography. His works were frequently collected (1534, 1538, 1542, 1544, etc.), best by Lenglet-Dufresnoy (4 vols., 1731), and Jannet (4 vols., 1868–72). The elaborate edition of Guiffrey, begun in 1876, has not yet been completed, only three of the six volumes having thus far appeared. The best biography is that of G. Guiffrey (1911). Consult also: Henry Morley, *Clement Marot, and other Studies* (London, 1871); E. O. Douen, *Clément Marot et le Psautier huguenot* (2 vols., Paris, 1878–79); A. A. Tilley, *Literature of the French Renaissance*, vol. i (New York, 1904). Other works of interest relating to him are Voizard, *De Disputatione inter Marotum et Sagontum* (Paris, 1885); Paul Bonnefon, "Le différend de Marot et de Sagon," in the *Revue d'histoire littéraire de la France*, vol. i (ib., 1894); Henry Guy, *De Fontibus Clementis Maroti Poetæ* (ib., 1898); Albert Wagner, *Clément Marots Verhältniss zur Antike* (Leipzig, 1906); Lefranc, *Grands écrivains de la Renaissance* (Paris, 1914).

MAROT, Daniel (c.1660–1718). A French decorative designer and engraver, born in Paris, son of the architect and engraver Jean Marot. Daniel Marot, being a Huguenot, fled to Holland in 1685 when the Edict of Nantes was revoked, and accompanied William of Orange to England, where he was appointed one of the King's architects and was especially active at Hampton Court. Much of the furniture there was designed by him and resembles the plates in his published books, especially the monumental beds with their plumes of ostrich feathers and elaborate crimson-velvet valances. At Windsor Castle there is a silver table attributed to him. After the death of King William in 1702 Marot returned to Holland, where in 1712, at Amsterdam, he published *Œuvres du Sieur D. Marot, architecte du Guillaume III, roi de la Grande Bretagne*. As a youth in France he made many designs for Boulle, especially of tall clocks and bracket clocks, and his style is always definitely Louis XIV. The most accessible collection of his designs is in T. A. Strange's *French Interiors, Furniture, etc.* (London, 1907).

MAROT, Helen (1865–). An American labor leader. She was born in Philadelphia and was active in the labor movement there and in New York, where she became executive secretary of the Woman's Trade Union League. She was also an investigator of child-labor conditions. Her writings include *A Handbook of Labor Literature* (1899) and *American Labor Union* (1914), the latter being an authoritative presentation of the trade-unionist point of view of the labor movement.

MAROT, Jean (1620–79). One of the greatest of French architectural engravers. He was born in Paris, designed numerous houses, and was for a short time associated with Jacques Lemercier (q.v.). He published *Architecture française, ou recueil des plans élévations, coupes, et profils des églises, palais, hôtels, et maisons particulières à Paris* and a work on the château of Richelieu. He was the father of Daniel Marot.

MARO'ZIA. A Roman lady of the tenth century who played an important part in the political history of the times. She was the daughter of the infamous Theodora (q.v.) and Theophylact, "consul and senator of the Romans." Her first husband was Alberic (q.v.); after his death she married Guido of Tuscany; and after the death of the latter, Hugo, King of Italy. By the power of her family and by her marital alliances she had entire control of Rome for some years. She deposed Pope John X in 928, and in the following year he was either strangled or starved to death. A little later she bestowed the papacy upon her son, John XI, who by popular rumor was supposed to be the offspring of her guilty love with Pope Sergius III. She styled herself "Senatrix" of all the Romans and "Patricia." Soon after her third marriage Marozia and her husband were thrown into prison in 932 by her son, Alberic II (q.v.). Her husband escaped, but nothing is known of her fate. Consult Ferdinand Gregorovius, *History of the City of Rome in the Middle Ages*, translated from the fourth German edition by Annie Hamilton, vol. iii (London, 1895).

MAR'PLOT. A meddling, good-natured busybody in the *Busybody* (q.v.).

MARPLOT, or the Second Part of the Busybody. A comedy by Susanna Centlivre (q.v.). It was performed at the Drury Lane Theatre, Dec. 10, 1710, and afterward altered by Henry Woodward and called *The Marplot of Lisbon*. This character reappears in 1825 as Paul Pry in the comedy by John Poole, and resembles Sir Martin Marall in Dryden's successful comedy, founded on Lord Newcastle's *Marplot*, a translation of Molière's *L'Etourdi*.

MAR'PREL'ATE, Martin. See Martin Marprelate Controversy.

MARPURG, mär'pu̇rk, Friedrich Wilhelm (1718–95). A German writer on music, born at Seehausen in Prussian Saxony. Little is known of his early life, but in 1746 he was secretary to General von Rothenburg at Paris, where he met Rameau, Voltaire, and D'Alembert. From there he went to Hamburg, and in 1763 was made director of the government lottery in Berlin. He composed six clavier sonatas, organ pieces, and sacred and secular songs. He is, however, better known as a writer on music, his most noteworthy works being: *Abhandlung von der Fuge* (1753–54), a standard work; *Handbuch beim Generalbass und der Composition* (1755–58); *Anleitung zum Clavierspielen* (1755); *Anleitung zur Musik überhaupt und zur Singkunst insbesondere* (1763), which are of interest at the present time.

MARQUAND, mär-kwänd', Allan G. (1853–). An American archæologist and art historian. He was born in New York and after graduating from Princeton studied at Berlin and Johns Hopkins universities (Ph.D., 1888). In 1896–97 he was professor of archæology at the American School of Classical Studies at Rome and from 1883 was professor of art and archæology at Princeton, serving also as director of the museum of historic art from 1890. In 1885 he became associate editor of the *American Journal of Archæology.* Among his writings are: a valuable *Textbook of the History of Sculpture* (1896–99), written in collaboration with A. L. Frothingham; *Greek Architecture* (1909); *Della Robbias in America* (1912); *Luca della Robbia* (1914); beside contributions to journals of art and archæology. He is considered the principal authority on the Della Robbias and their art.

MARQUAND, Henry Gurdon (1819–1902). An American capitalist and philanthropist, born in New York City. He prepared for college, but went into business as agent of his brother, Frederick Marquand (1799–1882), a New York jeweler and a benefactor of Union Theological Seminary and Yale Divinity School. This post the younger brother held for 20 years, after Frederick's retirement in 1839. Afterward he became prominent in Wall Street, especially in connection with railroad enterprises. Among his benefactions, mention should be made of a chapel and, with Robert Bonner (q.v.), a gymnasium presented to Princeton University, of a pavilion to Bellevue Hospital, and of contributions of paintings and other beautiful objects to the Metropolitan Museum of Art.

MARQUARDT, mär'kvärt, Joachim (1812–82). A German historian and antiquarian, born at Danzig. He studied at Berlin and at Leipzig and in 1859 was appointed director of the Gymnasium at Gotha, where he remained until his death. His chief work was his continuation of W. A. Becker's *Handbuch der römischen Altertümer* (1849–67). To the second edition (1871–82), almost completely rewritten, in which he was assisted by Theodor Mommsen, he contributed *Römische Staatsverwaltung,* vols. iv–vi (1873–78, 1881–85); and *Das Privatleben der Römer,* vol. vii (1879–82; 2d ed., 1886).

MARQUE (Fr., seizure), Letters of. Commissions issued by a belligerent state to vessels owned and manned by private persons, either its own citizens or neutrals, authorizing them to carry on hostilities at sea against the enemy. The usage originated in the practice of issuing letters of license to go across the boundary (mark, or march) and make reprisals. Such vessels were known as privateers and were freely employed by maritime nations at war in the sixteenth and seventeenth centuries. In the latter part of the eighteenth century most of the states of Europe enacted laws forbidding their subjects to take letters of marque from any foreign power for use against any power with which they themselves were at peace, and similar laws were passed by the United States Congress in 1797 and 1816. This put an end to privateering by neutrals, but the practice of authorizing subjects of a nation at war to prey on the enemy's commerce continued to the middle of the last century. It was declared abolished by the Declaration of Paris, which concluded the Crimean War (1856), and the declaration was accepted by most of the powers. Of the great powers only the United States refused to become a party to the declaration unless it included a provision exempting innocent commerce of a belligerent from capture by the enemy. As this has not yet (1915) been conceded the government of the United States is still technically free to employ this method of carrying on maritime warfare, but as no civilized state has issued letters of marque since the Conference of Paris, the practice may be considered obsolete. The use by a belligerent government of fast merchant vessels as auxiliary cruisers must not be confounded with the practice of privateering. In that case the private vessel is taken over by the government and embodied in its regular naval force. See Privateering.

MARQUESAS (mär-kā'sȧs) **ISLANDS,** or **MENDAÑA** (mȧn-dä'nyȧ) **ISLANDS** (Fr. *les Marquises*). A group of islands in Polynesia, in about lat. 10° S. and long. 140° W. Area, 494 square miles (Map: World, Western Hemisphere, K 7). The most important members of the group are Nukahiva (183 square miles) and Hiva-oa (153 square miles). The 11 islands, of which six are inhabited, fall into two groups which show considerable differences of dialect. With the exception of a few atolls, they are mountainous, falling abruptly into the sea on all sides, and reaching in Hiva-oa an altitude of 4158 feet. The summits are bare, and only the narrow valleys, terminating in small bays, and filled with luxuriant vegetation, are inhabited. Climate is hot and generally humid, though for six months in the year there is very little rainfall. The chief product, like that of Polynesia in general, is copra; oranges are also produced. The Marquesans form an interesting group of the Polynesian race, of which they are physically among the best representatives. They are very tall, with subdolichocephalic head form. In language they are closely related to the Hawaiians, and one stream of Hawaiian migration passed through the Marquesas. The Marquesans are an admixture of Proto-Samoan and Tongafiti elements, with a strong preponderance of the latter. Among Marquesan things worthy of note are the carved and ornamented axes and oars, feather diadems, coconut slings, carved paddle-shaped clubs, etc. Their food consists very largely of breadfruit. The Marquesans appear to have been warlike, and traces of cannibalism lingered long among them. The stone terraces of Waiko are of interest in connection with similar remains elsewhere in Polynesia. (See Megalithic Monuments.) The inhabitants are

steadily decreasing in numbers. In the early part of the nineteenth century the population was estimated at 20,000; in 1876 it was 5240; in 1900, 4300; and, in 1912, 3117. The Marquesans are all civilized and Christians; there are very few Europeans in the islands. The group is administered by native chiefs subject to the French Resident at Hiva-oa. The southern group of the Marquesas was discovered in 1595 by Mendaña de Neyra, a Spanish navigator; the northern group was discovered in 1791 by an American, Ingraham, who gave it the name of Washington Islands. Peculiar interest attaches to the Marquesas because of the fact that this archipelago was the first noncontiguous territory to be annexed to the United States. This assumption of sovereignty was proclaimed in 1813 by Commodore David Porter, of the *Essex*, but no action was taken by the government at Washington. The islands were left very much to themselves until 1842, when they were annexed by France. Consult Vincendon, *Iles Marquises* (Paris, 1843), and Churchill, *Easter Island* (Washington, 1912).

MARQUESS. See MARQUIS.

MAR'QUETRY (Fr. *marqueterie*, from *marqueter*, to inlay, from *marque*, mark). A decorative or pictorial inlay (q.v.) on furniture, of thin pieces of wood or veneer, ivory, bone, brass, tortoise shell, mother-of-pearl, etc. Marquetry is the French name for what the Italians call tarsia (q.v.), from which it was derived. The most famous French maker of marquetry was André Charles Boulle (q.v.). He was the nephew of Pierre Boulle, who married the daughter of the King's *marqueteur*, Jean Macé, of Blois. On the death in 1672 of Jean Macé after 30 years in the royal service with lodgings at the Louvre, Colbert wrote to the King, who was absent from Paris on a military campaign: "The *ébéniste* who used to make the panels of frogs is dead; he has a son who is not skillful in his profession. A man named Boulle is the most skillful man in France. Your Majesty will ordain, if it pleases him, to which of these he wishes to grant his lodgings in the galleries." Louis XIV replied: "The lodgings in the galleries to the most skillful," which of course meant André Charles. Realizing that the sombre tones of ebony were not satisfactorily softened either by *pietra dura* (q.v.) ornament or by the ivory inlays of Italy and Flanders, he increased the amount of colored ornament and lessened the amount of ebony groundwork, developing especially the art of brass and tortoise-shell inlay. His process was similar to that of wood marquetry, which he also employed extensively. He glued together two sheets of brass, or white metal, upon two sheets of tortoise shell and cut the outline of the design through all the four layers. The result was four replicas of the pattern and four replicas of the ground or matrix. By inserting the metal patterns in the tortoise-shell grounds, and the tortoise-shell patterns in the metal grounds, two complete sets were obtained. The first two, known as *Boulle première-partie*, are preferable, being less shiny and taking the engraving better than when the pattern is in the dark tortoise shell of *contre-Boulle*. Boulle also accentuated salient points of the framework of his furniture with brass and bronze mounts and gilded carving. Splendid examples of his work are the two *armoires* that brought £12,000 at the Hamilton sale, and the marriage coffer at the Louvre, illustrated in color on Plate XL of Foley's *Decorative Furniture* (London, 1910). An incendiary fire that destroyed his workshops in 1720, with their wonderful collection of furniture, models, and materials, ruined him, so that he bequeathed to his four sons an incubus of debts. Among great French marquetry makers of the eighteenth century are Foulet, Oeben, and Riesener. In the Wallace collection, London, there is a desk once part of the French crown furniture, sold in Holland to Sir William Hamilton, purchased from him in Naples by Sir Richard Wallace, and signed "Riesener fecit," with the date, Feb. 20, 1769. It is similar in design to the famous Bureau du Roi Louis XV in the Louvre, of which there is a copy in the Wallace collection. From the Netherlands, where tarsia flourished during both the sixteenth and seventeenth centuries, it came to England during the reign of William and Mary, and to some extent before. During the Georgian period (see INTERIOR DECORATION; FURNITURE) it was largely supplanted by carving, until the classic revival of the Adam period, beginning about 1760, when it in turn supplanted carving. Consult F. H. Jackson, *Intarsia and Marquetry* (New York, 1903). See FURNITURE.

MARQUETTE, mär-kĕt'. A city and the county seat of Marquette Co., Mich., 400 miles by rail north of Chicago, on Iron Bay, an inlet of Lake Superior, and on the Duluth, South Shore, and Atlantic and the Munising, Marquette, and Southeastern railroads (Map: Michigan, B 2). The city, noted for its charming scenery, clear and cool atmosphere, and fine buildings and streets, is popular as a summer resort, and is the principal shipping point for the mineral wealth, mainly iron, of the region. It has a fine harbor and regular steamship communication with important lake ports, and its ore docks, well equipped with the latest devices for handling traffic, are among the largest in the world. There are blast furnaces, redstone and trap-rock quarries, chemical works, ironworks, foundries, and machine shops; carriage, sash, door, and blind factories; lumber mills, a wood-alcohol plant, etc. Among the notable structures are the United States Government building, city hall, courthouse, Northern State Normal School, new manual training and high school, opera house, Peter White Public Library, Protestant Episcopal, Roman and French Catholic cathedrals, Catholic Orphanage, St. Mary and St. Luke hospitals, Father Marquette Monument, and the State House of Correction and Branch of State Prison in Upper Peninsula. Presque Isle, a headland of 400 acres north of Marquette, was presented to the city by the Federal government and has been converted into an attractive park. The water works, electric-light plant, power plant, costing $500,000, a cemetery, electric-supply shop, and a stone crusher are owned by the municipality. Marquette, named in honor of Père Marquette, the French missionary explorer, was settled in 1845, when the rich deposits of iron ore began to be exploited. The first dock was completed in 1854 and a railroad to the mines three years later. The city's subsequent prosperity has been marked. In 1913 it adopted the commission form of government. Pop., 1900. 10,058; 1910, 11,503; 1914 (U. S. est.), 12,117; 1920, 12,718.

MARQUETTE, JACQUES (1637–75). A French missionary and explorer in America. He was born at Laon in France. When 17 he entered the Jesuit Order, and in 1666 was sent

as a missionary to Canada. There his superiors sent him to the country of the Upper Lakes, and in 1668 he founded the Mission of Sault Ste. Marie. In 1673 Marquette, who was then in charge of the newly founded mission at Mackinaw, was instructed to accompany Louis Joliet on his expedition, sent by the Governor, Count Frontenac, to find the Mississippi. Seven men, in two birch canoes, set out on May 17. They went to Green Bay, up the Fox River, the rapids of which they passed by portage, and then on to its source, where guides were obtained from an Indian village. They crossed to the Wisconsin and floated down that stream for a week. On June 17 they entered the Mississippi, on the waters of which another week was passed before they reached a village of Illinois Indians. They passed the junction of the Mississippi and Missouri rivers, and at the mouth of the Arkansas found Indian villages, whose occupants received them with great kindness and no little curiosity. The voyagers continued southward to lat. 33° 40′, then, fearing lest they should be made prisoners by the Spaniards, they started on the return trip. On reaching the Illinois River they ascended it, and are supposed to have made the portage from the head of this stream to Lake Michigan, at or near the site of Chicago. After an absence of four months and a voyage in canoes of 2550 miles, they again made Green Bay, in the latter part of September. In October (1674) Marquette obtained permission from his superior to found a mission among the Illinois Indians. With 10 canoes he went to Green Bay, made a difficult portage through the forest to Lake Michigan, and followed the west shore of the lake to the Chicago River, where the party built a hut and passed the winter, as Marquette had become so enfeebled by illness that it was impossible for him to proceed farther. In March he was able to resume the journey. The party crossed the portage to the Illinois River and were most hospitably received at the Indian town of Kaskaskia. Marquette's condition was so serious that his party was forced to turn homeward. They reached Lake Michigan and followed the eastern shore towards Michilimackinac. Marquette did not live to reach his post, dying on May 18, 1675, near a small stream, a little south of that which now bears his name. He was buried in the wilderness, but in 1676 the bones were exhumed by a party of Ottawa converts and carried to the mission of St. Ignace, north of Mackinaw, where they were interred beneath the floor of the chapel. Marquette was a man of singular sweetness and serenity of disposition, and his influence over the Indians was great and beneficent.

Bibliography. Jared Sparks, "Life of Father Marquette," in *Library of American Biography*, vol. x (New York, 1854); "Joliet and Marquette on the Mississippi," in *Old South Leaflets, Annual Series*, vol. vii (Boston, 1889); R. G. Thwaites (ed.), *Jesuit Relations* (Cleveland, 1896); id., *Father Marquette* (New York, 1902); J. D. G. Shea, *Early Voyages Up and Down the Mississippi* (Albany, 1902); id., *Discovery and Exploration of the Mississippi* (2d ed., ib., 1903); Francis Parkman, "La Salle and the Discovery of the Great West," in *France and England in North America*, part iii (Boston, 1907); John Finley, *French in the Heart of America* (New York, 1915).

MARQUETTE UNIVERSITY. A Roman Catholic institution for higher education, founded at Milwaukee, Wis., in 1864. The university includes a college of arts and sciences and schools of law, engineering, economics, medicine, dentistry, pharmacy, and music. There is also an academic and a premedical department. The total attendance in all departments in 1914–15 was 1187. Of these 270 were in the academic department; in the college of arts and sciences there were 40; in the school of law 140; in the school of engineering 60; in the school of economics 87; in the school of medicine 140; in the school of dentistry 180; in the school of pharmacy 70; in the school of music 160; and in the premedical department 40. The instructors in various departments numbered 254. The university has no foundation funds, but is entirely dependent on tuition fees and gifts. The medical college has a "Class A" rating from the American Medical Association. The value of the grounds, buildings, and equipment is estimated at about $800,000. The main library contains about 15,000 volumes and the department libraries about 16,000 volumes. The president in 1915 was James Grimmelsman, S.J.

MARQUEZ, mär′kās, LEONARDO (c.1820–?). A Mexican general. He served against the United States in the Mexican War, and was a prominent supporter of Santa Anna in the revolutionary movement of 1849. After the fall of that dictator Marquez espoused the cause of Miramon and Zuloaga against Juarez. In 1862 he took up the cause of the French, and rendered important service to the establishment of the power of Maximilian, by whom he was placed at the head of the regular army, and was, in 1864, given the mission to Constantinople. He returned in 1866, and a year later, when the French withdrew, he undertook to organize a native army to support the Empire. In October, 1866, Maximilian made him a division commander and in March, 1867, sent him to Mexico City to form a cabinet and raise troops for the relief of Querétaro. He joined Maximilian at Querétaro, but broke through the besiegers and made his way to Mexico City for the purpose of organizing a force to relieve the Emperor. Finding this impossible, he conceived the plan of setting up an independent government of his own in the Southern States, with Puebla as its capital. He was defeated before he could reach that city and returned to Mexico, where he was besieged by General Díaz. The city was captured, June 21, 1867, and Marquez, after remaining in concealment for several months, made his way to Vera Cruz, and then to Havana. He was expressly excluded from the amnesty of 1870. As a soldier and politician his motives were less marred by personal ambition than those of most of the leaders of Mexican affairs. He was fanatical and cold-blooded in his disregard of human life, receiving the nickname of "The Tiger of Tacubaya" for the wholesale executions which followed one of his guerrilla victories in 1859, though he alleged the express order of Miramon as an explanation. For an account of Marquez's military career consult H. H. Bancroft, *History of Mexico*, vols. v and vi (San Francisco, 1888).

MARQUIS, mär′kwĭs, or **MARQUESS** (OF. *markis, marquis*, Fr. *marquis*, from ML. *marchensis*, prefect of a frontier town, from *marcha, marca*, from OHG. *marka*, boundary, march). The degree of nobility which in the peerage of England ranks next below duke. Marquises were

originally commanders on the borders or frontiers of countries, or on the seacoast, which they were bound to protect; the German equivalent is *Markgraf*. The first English marquis in the modern sense was Robert de Vere, Earl of Oxford, who was created Marquis of Dublin by Richard II in 1385. The oldest existing marquisate is that of Winchester, created by Edward VI in 1551. See MARK.

MARQUIS, mär'kwīs, THOMAS GUTHRIE (1864–). A Canadian author, born at Chatham, New Brunswick, and educated at Queen's University, Kingston, where he graduated in 1889. He was successively English master at the High School, Stratford, and at the Collegiate Institute, Kingston, and principal of the Collegiate Institute, Brockville. Retiring from teaching in 1901, he devoted himself to literature. He was chief editorial writer of the Ottawa *Free Press* (1905); was office editor of *Canada and its Provinces* (1914–15), a series of studies, in 22 volumes, of Canadian history and development. For this work he edited the Pacific Provinces section, and wrote several monographs. His publications include: *Stories of New France* (1890), in collaboration with Agnes Maule Machar (q.v.); *Stories from Canadian History* (1893); *Marguerite de Roberval: A Romance of the Days of Jacques Cartier* (1899); *Canada's Sons on Kopje and Veldt* (1900); *Life of Lord Roberts* (1901); *Presidents of the United States* (1903); *Brock: The Hero of Upper Canada* (1912); *The War-Chief of the Ottawas* (1914); *The Jesuit Missions* (1915). The last two are in the "Chronicles of Canada Series." He also edited *The Builders of Canada* (1903), a collection of biographies of eminent Canadians by well-known writers.

MARRADI, mä-rä'dē, GIOVANNI (1852–). An Italian poet, born at Leghorn. He was educated at the University of Pisa and afterward studied at Florence. In 1877 he founded, with Severino Ferrari and others, the poetic journal *I nuovi Goliardi*. He is essentially a poet of nature, and especially of the sea. Works: *Canzoni moderne* (1878); *Fantasie marine* (1881); *Canzoni e fantasie* (1883); *Ricordi lirici* (1884); *Poesie* (1887); *Nuovi canti* (1891); *Ballate moderne* (1895); *Rapsodia Garibaldina* (1905). Consult Croce, "G. Marrodi," in *La critica*, vol. iv (Paris, 1906).

MAR'RAM GRASS. See AMMOPHILA.

MARRELLA, mär-rĕl'ä. A crustacean genus that has been recently uncovered in fossil form in the Middle Cambrian shales (Stephen formation) of British Columbia. Its exact taxonomic position is unknown; it is characterized, however, by a subquadratic carapace, two immense posterolateral spines, sessile eyes, and five pairs of appendages on the head. The abdomen has 24 pairs of long, slender, pinniferous legs and the telson is a small plate. The fossils are remarkably preserved, with thin delicate gills and alimentary canals still distinct notwithstanding their great age. See STEPHEN FORMATION.

MARRIAGE (OF., Fr. *mariage*, from ML. *maritaticum*, marriage, from *maritus*, husband, from *mas*, male, husband). A union of man and woman, usually for the purpose of *consortium*, or cohabitation, which is sanctioned by the law or custom of the community. The sanction may be moral, religious, or legal. This definition is broader than that of legal usage, which makes marriage only a legal form or the status corresponding thereto; and it is not so broad as Westermarck's definition, "a more or less durable connection between male and female, lasting beyond the mere act of propagation till after the birth of the offspring." Properly speaking, the mating of animals is not marriage, and in no community of human beings is sexual union regarded as marriage until it is socially sanctioned in some way. On the other hand, communities which can hardly be said to have a positive law not infrequently attach the deepest significance to customary and religious sanctions applied to sexual relations. There has been, however, an unbroken continuity of historical forms, some of which have fallen short of marriage in any true sense, some of which have fallen short of marriage in a legal sense, while others, emerging as civil marriage, have dropped the earlier religious sanctions.

A survey of marriage in its historical evolution discloses the fact that the unions of men and women have not been restricted to the simple mating of one individual with one of the opposite sex which becomes the basis of monogamy. There have been unions of one woman with two or more men (polyandry) and of one man with two or more women (polygyny), and such arrangements have been socially approved.

Distinguished ethnologists have maintained that relatively permanent sexual unions have slowly developed out of an original promiscuity. There is, however, no satisfactory evidence that a state of true promiscuity ever existed among human beings, and the hypothesis is rendered inherently improbable by our knowledge that among the lower animals a distinct progress towards true pairing is observed as we ascend the scale from the lower to the higher vertebrata.

Chief among the facts which suggested the hypothesis of a primitive promiscuity is the widespread custom among uncivilized men of tracing names and descent through the mother instead of the father. It has been shown that the civilized races also, including the peoples of Aryan culture, in all probability passed through this matronymic stage. Furthermore, a sufficient explanation of descent in the female line is found in the general instability of pairing arrangements among primitive men. If a mother with her infant remains with her own kindred, or returns to them, she naturally keeps, and her child takes, her clan name; and her brethren or other near clansmen become the child's natural protectors.

It seems probable that from the first sexual mating among human beings has tended towards monogamic unions, but that permanency of union has been of slow growth. Among the lowest savages, such as the Australians, the Bushmen, the Fuegians, the forest hordes of Brazil, and the Innuit, a mating of one man with one woman for an indefinite, but usually not long period, is the common arrangement.

Nevertheless, in tribes somewhat more advanced but usually dwelling in extreme poverty, various forms of polyandry, or the union of one woman with two or more men, or of a group of women to a group of men, is found in many parts of the world, and undoubtedly prevailed widely in the past. In Tibetan polyandry, so called, the husbands are brothers. In Nair polyandry, or the form which prevails among the Nairs of India, the husbands of a woman may originally have been strangers to one another. Cæsar speaks of a polyandry like the Tibetan as practiced among the Britons. In the Hawaiian

Islands, before they were invaded by whites, a common form was the so-called Punaluan family, in which a number of brothers cohabited with a group of sisters, each man consorting with each woman, and each woman with each man. A conservative explanation of the known facts seems to be that primitive hordes, except perhaps in the most favorable environments, were small, as are the hordes of the lowest savages to-day, and were therefore composed of near kindred commonly marrying in and in. Under such circumstances the cohabiting group may often have been a consanguine family, a Punaluan family, or a family like that created by the Tibetan polyandry. Yet probably from the first a temporary consorting of one man with one woman was the more frequent arrangement. A horde thus marrying in and in is called *endogamous*. Two ways in which a group becomes *exogamous* (taking consorts from other groups) are recognized. Where neighboring hordes, or groups of kindred, live on friendly terms with one another, often participating in common festivities or religious observances, men frequently leave their own kindred and go to dwell with women in another group. They become in such cases in many particulars subject to the male kindred of their wives. Where neighboring groups live on bad terms with one another, frequently engaging in war, captured women may be appropriated by their captors. That wife capture has been a custom in every part of the world is admitted by all ethnologists, and there is a general agreement that the not less widespread custom of wife purchase may have grown out of wife capture. The practice of offering women to actual or potential foes as an act of propitiation probably played a large part in the origin of exogamic custom. The strict rule of exogamy is found only where the clan or gens (see GENS) is well developed, and it there is a rule of the clan as such, rather than of the horde or tribe. Where tribes are constituted of clans the clan is exogamous, and the tribe as a rule is endogamous. That is to say, men may not marry their clanswomen, but usually marry women of another clan within the same tribe.

The forms of sexual relationship thus far mentioned, let us now recall, are not necessarily marriages. Any one of them may exist in a community where the only legal union of man and woman, and the only one sanctioned by religion and public opinion, is monogamy. Any one of them becomes marriage through social sanction. There can be little doubt that religious sanctions constituting marriage are older than the legal. To the savage with his belief in imitative and sympathetic magic many things appear dangerous, and he avoids them, making them taboo. In savage communities the sexes are usually taboo to one another until by some ceremony of magic the taboo is broken. The initiation ceremonies, whereby boys and girls at puberty are admitted to certain sexual mysteries, are of this nature. They partially break the sexual taboo. The marriage ceremony is the complete and final breaking. Usually whatever is taboo may safely be touched if first it has been approached in some exceedingly careful way, or partaken of in a homœopathic portion, whereby an immunity is established. Conformably to this idea the sexual taboo is broken by such harmless approaches as the joining of hands or the partaking of a meal together. Some of the most frequent incidents of marriage ceremony are thus seen to have had their origin in that savage magic which was the first great system of social sanctions, long antedating those which were developed into positive law.

LAW OF MARRIAGE

Historical Development. The law of marriage in all Christian countries is derived from the canon law, i.e. the law established by the Christian Church in the Middle Ages. The canon law drew many of its rules regarding marriage from the Roman civil law, and it was influenced, to some extent, by Teutonic ideas; but in many respects its marriage law was novel. In nearly all Christian countries the canonical rules have been seriously modified during the last four hundred years. The changes which began with the Protestant Reformation were at first worked out by the Protestant churches and embodied in Protestant ecclesiastical law; but a tendency to regulate marriage by civil legislation appeared in the sixteenth century, and at the present day, even in those countries which have adhered most closely to the rules of the canon law, marriage is governed by the ordinary civil law.

Roman Civil Law. Marriage could be established only between Roman citizens, or between Romans and such foreigners as had by treaty the right of intermarrying with Romans (*ius connubii*). Originally, no intermarriage was possible between the gentiles or patricians and the plebeians; and after intermarriage between the orders had been legalized (445 B.C.), gentiles continued to marry, in most cases, within their own order, and often within their own *gens*. The marriage of near blood relations, however, was forbidden; originally, those related in the sixth degree (e.g. children of first cousins) were not allowed to intermarry. In the third century B.C. marriage was permitted between persons related in the fourth degree (e.g. first cousins). The legislation of the Empire varied: at one time (49 A.D.) a man was allowed to marry his brother's daughter, but in the fourth century this was made a capital offense, and in the fifth century the marriage of first cousins was again for a time prohibited. The relations established by adoption (q.v.) were treated as equivalent to relations of blood kinship. Affinity was a bar in the direct line only, until the end of the third century, when marriage with a sister-in-law (the brother's widow or his divorced wife, and the deceased or divorced wife's sister) was prohibited. Justinian, under the influence of the Christian Church, forbade marriage between godparents and godchildren on the ground that baptism established a spiritual kinship. Under the same influence the Theodosian Code had already prohibited marriage between Christians and Jews.

In the older civil law there were three modes of establishing marital power (*manus*). For the patricians there was a religious ceremony, *confarreatio;* for the plebeians there was fictitious purchase, *coëmptio*, and also prescription, *usus*. The acquisition of marital power by prescription implied that the man and the woman were living together without any preceding ceremony. At an early period this informal union was treated as marriage, even though the prescription was annually interrupted and never became complete. This marriage *consensu*, i.e. by agreement, was usually accompanied by religious observances,

such as the taking of auspices, by a banquet, and by the ceremonial taking of the wife to the husband's house, but none of these things was necessary: *consensus, non concubitus, facit nuptias.* In the course of time the consensual marriage supplanted all other forms except the *confarreatio,* which was occasionally used in some of the old families until the empire became Christian. The consensual marriage was a "free marriage" in two senses: it gave the husband no power over the person or property of his wife, and it was dissoluble at the will of either party.

Marriage could be established when both parties had reached the age of puberty, which was fixed at the completed fourteenth year for males, at the completed twelfth for females. Betrothal (q.v.), *sponsalia,* could take place at any time after the seventh year. When the parties, or either of them, were under paternal authority, no betrothal or marriage was valid without the paternal authorization.

The remarriage of widows was regarded in the older Roman ethics as improper, but it was never legally prohibited. In the later Imperial law it was prohibited for ten months, unless within that period a child had been born. In the later Imperial law, certain property disadvantages were attached to second marriages, both as regarded husbands and wives; but the object was not to penalize second marriages, but to secure the interests of the children of the previous marriages.

Early German Law. The usual form of marriage among the Scandinavians, the Germans proper, and the Anglo-Saxons was wife-purchase. The girl was bought from her father or guardian, and delivered by the father or guardian to the buyer. Abduction of a girl without payment seems to have been regarded as a mode of marriage, but the husband did not obtain complete marital authority until he had paid the customary compensation to the father or guardian. In the earliest written laws the price paid is beginning to be regarded as something that belongs to the woman, not to the father or guardian; it is *dos* or dower in the later English sense—i.e., a provision for widowhood—and instead of paying it over to the father or guardian, the bridegroom gives security for its payment on his death to his widow. In the earliest written laws also the purchase marriage consists of two separate transactions: (1) the agreement between the bridegroom and the bride's father or guardian, in which each formally binds himself to perform his part of the contract, and (2) the delivery of the bride, together with the payment of the price or the giving of security for its payment to the widow. As the formal contract of the old German law consisted in the giving of symbolic pledges, *wadia,* the first of these transactions was a *wadiatio* (Anglo-Saxon, *bewed-dung*), while the second was a "giving" (Anglo-Saxon, *gifta*). The *wadiatio* was more than a betrothal, it was an inchoate marriage. It produced some of the legal results of marriage, while other results attached to the giving, and others again to cohabitation. In the later development of the German law the *wadiatio* was described as *Verlobung* or promising, and consisted in the exchange of promises between bridegroom and bride, and the giving became the *Trauung* or intrusting. *Verlobung,* however, in the German view, was always something more than a Roman betrothal, and the German view was not without influence upon the development of the canon law.

Roman Canon Law. The Roman Catholic church considers marriage as a sacrament which conveys divine grace to the recipients for the purpose of enabling them to perform well the duties of the conjugal state. This aspect has nothing to do with the validity of the marriage as a civil contract; nor does the Church by this teaching deny that valid marriages are contracted outside its communion. But, considered as a sacrament of the Catholic church, it cannot be received by an unbaptized person, or properly by any one who is in a state of mortal sin. By the general view of theologians, since the consent of the parties is considered the essential part of the sacrament, they are themselves held to be the "ministers" of it: the priest simply adds the Church's benediction. Since marriage was considered a sacrament, it was early asserted that as such its regulation fell within the exclusive jurisdiction of the Church. The claim was recognized; and in the exercise of its jurisdiction the Church developed a uniform law of marriage for all Western Christendom. It did not claim to regulate the property relations of husband and wife, but it regulated the establishment and determined the validity of marriages. The principal inference which the Church drew from the sacramental theory was that marriage was indissoluble. The Church courts could declare that an existing union was not a valid marriage, i.e., they could declare a marriage null, on account of circumstances antecedent to or simultaneous with its establishment; and they could grant a separation from bed and board on account of circumstances that had arisen since the marriage; but they could not dissolve a marriage validly established by reason of any occurrences subsequent to its establishment.

There were numerous grounds on which a marriage could be set aside or annulled, called dividing or destructive impediments (*impedimenta dirimentia*), such as a previous marriage, a previous vow of celibacy, a difference of religion, impotence, etc. To the dividing impediments belonged also relationship within the forbidden degrees. The wide range of this impediment was perhaps the most peculiar feature of the canon law. The Church not only forbade marriage by reason of consanguinity and the legal affinity established by marriage; it attached the same result to the spiritual relationship established by participation in the sacraments of baptism and of confirmation, and to the illegitimate affinity established by unlawful *concubitus;* and it carried prohibitions based on affinity to the same degree as those based on blood kinship. Before 1215 the impediments of consanguinity and affinity extended to the seventh degree, but at the fourth Lateran Council Innocent III limited the prohibition based on consanguinity and affinity to the fourth degree (the seventh by the reckoning of the civil law, e.g., third cousins). From all these impediments of relationship, except those between ascendants and descendants and brother and sister, dispensation might be granted, as also from a vow of celibacy, a difference of religion, and lack of age. Lack of age, moreover, and lack of consent, were curable defects. In most cases, therefore, these dividing impediments did not render the marriages void, but only voidable. The hardships logically resulting from the annulment of marriage were

lessened by the doctrine of the "putative marriage." Where one of the parties to the invalid marriage was unaware of the impediment, that party, and also any children born of the union, were entitled to all the rights which would have been theirs if the marriage had been valid. In particular, the children were legitimate. This doctrine, however, reached over into a field which, even in the Middle Ages, was regarded as secular. The Church could say what was and what was not a marriage, but it could not regulate all the civil results of marriage, nor all the civil results of its annulment.

Other impediments were known as "impeding" or "prohibitive." To this class belonged, for example, a precontract *de futuro* (i.e., a previous betrothal to another person); also the nonobservance of ecclesiastical rules regarding banns. Disregard of such impediments subjected the offender to penalties, but did not invalidate the marriage.

It should be noted, however, that the Church's view of betrothal changed in the twelfth century. In the early Middle Ages the Church was strongly influenced by the German idea that betrothal was an inchoate marriage. In the twelfth century it went back to the Roman view that an agreement *de futuro* was a thing wholly distinct from marriage. Nevertheless, some concessions were still made to German ideas. It was admitted that an agreement to marry in future and subsequent *concubitus* constituted marriage. Moreover, marriages not consummated were treated somewhat differently from those which had been consummated: they were annulled with more freedom.

On the whole, the canonical marriage was the consensual marriage of the Roman law, made indissoluble. The ages of consent were the same, 14 and 12. It was customary to publish banns, to exchange trothplight at the church door, and to have the marriage consecrated by the priest inside of the church, but none of these things was necessary. The sacrament of marriage was one which the parties could administer to each other, and the clandestine unconsecrated marriage was completely valid. The consent of parents to the marriages of their children, which was required by the Roman law, was not required by the Church, not even in the case of minors. The law was changed, after the Reformation, by the Council of Trent, which decreed that a marriage, to be valid, must be celebrated by the priest of the parish or by some other priest delegated by him for the purpose in the presence of two or three witnesses. This decree, however, was not put in force in all Catholic countries (it is affirmed that it was not introduced into the American possessions of Spain), and where the Tridentine laws are not in force, the Catholic church continues to recognize the secret and unconsecrated marriage.

Protestant Ecclesiastical Law. The Protestant churches of the Continent rejected the sacramental theory of marriage. They regarded divorce as admissible. Luther revived the theory that betrothal was an inchoate marriage, and this view was dominant until the eighteenth century. In order to suppress secret marriages the Protestant churches demanded the consent of parents, or the presence of witnesses, or an ecclesiastical ceremony, or all these things, and before the end of the century it was held that the ecclesiastical marriage was the only perfect marriage; but in the cases where *concubitus* had occurred after a promise of marriage, it was usual not only to compel the man to go through the religious ceremony, but to "supply" his assent when he refused to give it. The impediments to marriage based on consanguinity and affinity were greatly reduced. Consanguinity was treated as a bar only within the third or fourth degree, affinity only in the direct line. Spiritual kinship was not recognized. There was manifested also a tendency to treat fraud as a ground for annulling marriage, providing it was made clear that but for the fraud the marriage would not have been contracted. Some of these changes were made by civil legislation, but until the nineteenth century legislation was for the most part guided by ecclesiastical opinion.

Modern Continental Legislation. Even in Catholic countries marriage is governed at the present time by civil legislation. The most important innovation of the nineteenth century is the civil marriage. In the eighteenth century publicity of marriage, established in Catholic countries by the Tridentine decrees, was secured in Protestant states in the same way, i.e., by compulsory religious marriage. In some states it was demanded that the rites of the established Church be observed; but exceptions were generally made in favor of the adherents of other confessions or of no confession, first, by permitting marriage to be celebrated according to the forms of any recognized confession, and finally by establishing civil marriage, i.e., marriage before a civil officer. The civil marriage is regularly preceded by notices, posted or otherwise published in the domicile of each of the parties, and the civil officer does not proceed to the marriage until he is satisfied that all the requirements of the law have been observed. At the outset the parties could choose between civil and religious marriage, or the religious marriage was made compulsory only upon members of the state church. Such a choice exists to-day in Austria, Spain, and Portugal. In a larger number of Continental states, however, civil marriage is obligatory. The parties may add a religious ceremony, but the religious marriage has no legal effect. This system obtains in France, Holland, Germany, Switzerland, and Italy.

The age of consent has generally been raised (to 18 and 15 in France, to 21 and 16 in Germany), but not in Spain. The consent of parents or guardians is required for the marriage of minors, and in many legislations the consent of parents is required even after majority. In some of these legislations, the only result attached to parental opposition after majority is to delay the marriage. In Germany, if the opposition of the parents appears unreasonable, the necessary consent can be given by the court. The Roman rule forbidding remarriage of a woman within the ten months following the dissolution of the previous marriage is generally retained in modern legislations. The hindrances based on consanguinity and affinity vary considerably in different states. In Germany consanguinity is a bar only in the direct line and between brothers and sisters; affinity is a bar only in the direct line. In France uncle and niece, aunt and nephew, and brother-in-law and sister-in-law are forbidden to intermarry, but dispensation may be granted by the head of the state. Even in the more conservative Catholic countries there is a tendency to limit the impediments of consanguinity and affinity. In Spain marriages within the fourth degree are pro-

hibited, but for non-Catholics the restriction reaches no further than to first cousins. As regards lack of consent, the doctrines of the canon law are generally followed in the modern civil legislations. Fraud per se does not generally invalidate a marriage, but in the German Code fraud by which consent has been induced has this effect.

English Common Law, and Acts of Parliament. That the general ecclesiastical law of Western Christendom prevailed in the British Islands until the Reformation, and that it continued to prevail after the Reformation until changed by Parliamentary enactments, was not seriously questioned by the courts until 1843. In that year the House of Lords decided, in Queen *v.* Millis (10 Clark and Finelly, 534), that, even before the Reformation, there was a special ecclesiastical law of England and Ireland, which was not in all points identical with the Roman canon law; that, in particular, the Roman doctrine that parties could contract a valid marriage by consent alone had never been a rule of English ecclesiastical law; that, on the contrary, the assistance and benediction of a priest had always been essential to a perfect marriage in England and Ireland. This decision denied, accordingly, that the form of marriage which is still known in the United States as the "common-law marriage" had ever been a perfect marriage at English common law. The correctness of this decision has been widely questioned, and further historical investigation has strengthened the opposite opinion (see Pollock and Maitland, *History of English Law*, II, 372, and Maitland, *Canon Law in England*). The opposite theory has always been held by the courts of the United States, and the decision in Queen *v.* Millis has not been accepted by the courts of Canada.

The marriage of which the validity was denied in Queen *v.* Millis was an Irish marriage. As far as England was concerned, the question had been settled by the Acts 26 Geo. II, c. 33 (Lord Hardwicke's Act) and 4 Geo. IV, 76, which required a Church marriage preceded by the publication of banns, except when a special license was secured, and which declared any other form of marriage invalid. Church marriage meant marriage according to the forms of the Established church, and from 1753 to 1836 no exceptions were made except in the cases of Quakers and Jews. Lord Russell's Act, 6 and 7 William IV, c. 85, supplemented by Acts 1 Vict., c. 22, and 19 and 20 Vict., c. 119, furnished a choice between marriage according to the forms of the Established church, marriage according to the forms of other registered confessions, and civil marriage before a registrar. Lord Hardwicke's Act further demanded the assent of parents or guardians to the marriage of minors, and the fact that it did not operate outside England led to the numerous "Gretna Green" marriages over the Scottish border. At present, under later acts of Parliament, the same election between various forms of marriage is given in Scotland and in Ireland as in England—an election between religious marriage according to the rites of any recognized confession and civil marriage. In Scotland the formless marriage still exists, as it still exists in the great majority of the commonwealths of the United States. All that is necessary to establish the marriage is the consent or agreement *in presenti*, i.e., an agreement of marriage as distinct from an agreement to marry at some future time.

With the requirement of public marriage in England and Ireland, the canonical rule that an agreement to marry followed by *concubitus* is marriage has been abrogated. In Scotland the rule is maintained. In the United States there is a conflict of authorities. Even at the canon law the rule was based on a presumption that consent *in presenti* had intervened, but this presumption was not rebuttable. Some of the American courts treat the presumption as rebuttable; a few decline to recognize the rule. Of course neither in Scotland nor in the United States will a relation which was originally meretricious be transformed into marriage by a promise to marry; nor was any such result recognized by the Catholic church. In accordance with the common rules, the common-law ages of consent are 14 and 12. If either party, by reason of idiocy, imbecility, or insanity, does not comprehend the nature and effect of the marriage contract, there is no marriage; but if the lack of comprehension is due to intoxication, the marriage is not void, but only voidable. Mistake, as at canon law, must be of such a character that there was really no consent. As regards fraud, the English courts follow the Roman ecclesiastical rule, that fraud *per se* is not a ground for annulling a marriage. As Sir F. H. Jeune said (in Moss *v.* Moss, 1897, P. D. 268), where marriage is said to be annulled for fraud, it is really annulled because of the absence of consent. The American courts, however, are inclined to admit that a marriage may be annulled by fraud, and they are especially inclined to admit such an annullment if the marriage has not been consummated.

In England, as elsewhere, the Reformation brought about a considerable reduction in the prohibitions of marriage based on relationship. Statutes of Henry VIII, repealed in part by a statute of Edward VI and wholly repealed by a statute of Philip and Mary, were partially revived in the first year of Elizabeth's reign; and the provision that survived simply stated that "no prohibition, God's law except, shall trouble or impeach any marriage outside the Levitical degrees." This was interpreted by the ecclesiastical courts to mean that consanguinity and affinity were impediments to marriage as far as the third degree of civil computation. Under this rule a man might not marry his aunt or his niece or the daughter of his deceased wife's sister, but might marry his first cousin. Relationship by the half blood was put on the same footing as that by the full blood, and illegitimate consanguinity was treated as equivalent to legitimate blood relationship. On the other hand, the illegitimate or natural affinity of the canon law, which was affirmed in 28 Henry VIII, c. 7, is held to have disappeared from English law with the repeal of that statute. The courts regarded marriages within the forbidden degree as voidable rather than void, but such marriages were declared void by Act of 5 and 6 William IV (1835). Repeated efforts to legalize marriage with the deceased wife's sister were finally crowned with success in 1907. In all the British colonies the prohibitions based on collateral affinity have been removed.

As to proof of marriage, the common law admits any evidence of matrimonial consent. Where a formal marriage, religious or civil, has taken place, it is presumed, until the contrary is shown, that the parties were able to marry, that their consent was complete and free, and

that all necessary forms were observed. If no formal marriage has taken place, or none is proved, the fact that the parties have lived together as husband and wife, have acknowledged themselves, or have been generally reputed, to be husband and wife, raises a presumption of marriage. This presumption, however, is invalidated if it can be shown that the relation was illicit in its origin.

It is a peculiar feature of the English and American common law that it gives an action for damages for breach of contract to marry. See BREACH.

Foreign Marriages. The question whether and under what conditions a court of law will recognize as marriage a union established in another jurisdiction is a question of conflict of laws (q.v.). The general rule, all over the civilized world, is that if the forms required where the marriage was established have been observed, the marriage will be recognized as formally perfect everywhere. The capacity of parties to marry is determined, according to the prevailing European theory, by the law of their domicile, and the English courts now follow this rule. In some of the European states, however, capacity to marry is determined by the law of the country of which the person is a citizen or subject, whether he or she be domiciled there or elsewhere. In the United States the courts follow the older English decisions, according to which the capacity of the parties to marry, as well as the sufficiency of the forms observed, is determined by the law of the State in which the marriage takes place: so that citizens of any State can escape the restrictions imposed by their own State by simply crossing the line into a jurisdiction where those restrictions are not imposed.

Statutory Rules in the United States. Lord Hardwicke's Act did not apply to the Colonies, and never became a part of the common law of the United States. In nearly all of the United States, however, statutes have been enacted providing for a ceremonial marriage, and in most cases requiring also a license to marry granted by the properly constituted officer, usually the clerk of the municipality where the marriage is solemnized or the officer having supervision over vital statistics.

The marriage ceremony is usually required to be performed in the presence of two or more witnesses, by a priest or clergyman of some church, or by certain enumerated civil officers, such as judges of courts of record, justices of the peace, police justices, mayors, aldermen of cities, and county clerks. Various penalties are imposed for failure to comply with the provisions of the statute, and in some States intentional violation of the law is made a criminal offense. In most States, in the absence of a positive provision of the statute that marriages not complying with the requirements of the statute shall be void, the statute is deemed to be directory only, and not in any manner to affect the validity of the so-called common-law marriage. This is substantially the law in all of the States except California, Illinois, Kentucky, Missouri, Maryland, Massachusetts, North Carolina, Vermont, Washington, and West Virginia, in all of which it is held that the common-law marriage has been abolished by statute. But in some of these States, notably Massachusetts, Washington, and West Virginia, there are validating statutes providing that mere irregularities when an attempt is made in good faith to comply with the statute shall not affect the validity of the marriage.

A statute of New York, passed in 1901, requires a nonceremonial marriage to be evidenced by a written agreement to be entered into in the presence of two witnesses and acknowledged in the same manner as conveyances of real estate. It would seem that this statute does away with common-law marriage in New York.

In many of the United States the age at which an infant may consent to marry has been raised by statute to 16 and in some of the States to 18 years. These statutes do not, however, change the common-law rule that such marriages are not void, but *voidable* only at the option of the infant or of his parent or guardian. See INFANT.

In Connecticut and Minnesota epileptics and feeble-minded persons are not allowed to marry, and several States have somewhat similar statutes. Michigan prohibits the marriage of persons afflicted with venereal disease. Twenty-five States prohibit marriage between whites and persons of negro descent, four States between whites and Indians, and five States between whites and Chinese. In 17 States the marriage of first cousins is forbidden.

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MARRIAGE, CONSANGUINEOUS. See CROSS BREEDING IN MAN.

MARRIAGE, IMPEDIMENTS TO. See IMPEDIMENTS TO MARRIAGE.

MARRIAGE, INTERRACIAL. See CROSS BREEDING IN MAN.

MARRIAGE, LEVIRATE. See LEVIRATE MARRIAGE.

MARRIAGE À LA MODE, ä lä mōd. A series of six paintings by Hogarth (1744) in the National Gallery, London, intended as designs for a series of engravings, as which they are most widely known. They show the results of a fashionable marriage between the son of an earl and the daughter of a rich London alderman, in subjects as follows: I. The Marriage Contract; II. After the Marriage (see illustration under HOGARTH); III. Visit to the Quack Doctor; IV. The Countess's Dressing Room; V. The Duel and Death of the Earl; VI. Death of the Countess.

MARRIAGE AT CANA. A favorite subject of Italian painters, especially of the Venetian school. The most celebrated examples are those by Paolo Veronese in the Louvre (1563) and by Tintoretto in Santa Maria della Salute, Venice. The former, one of the largest easel pictures in the world, contains over 130 figures, many of which are portraits of contemporary rulers and celebrities. It represents an elaborate Venetian feast, with rich architectural background. Other examples of this subject, which was a favorite one with Veronese, are in the Dresden Gallery and the Brera, Milan. In Tintoretto's "Marriage at Cana" the table is set lengthwise in a large hall, with Christ at the farther end and guests along both sides, a remarkable piece of foreshortening. Other large canvases of the same subject are by Moretto da Brescia at San Fermo and by Scarsellino in the Ferrara Gallery.

MARRIAGE SETTLEMENT. In the English law of real property a trust of real estate created for the purpose of securing to a wife a separate interest therein for her life free from the control of her husband. Such settlements were devised to protect the wife's property rights from the absolute control which was by the common law vested in the husband. This end was attained by conveying the land to trustees for the sole and separate use of the wife usually for life, though sometimes in fee. As the term 'settlement,' as a term of conveyancing, signified a conveyance of property to be held and enjoyed by two or more persons, as mother and child or children, in succession, a marriage settlement came to denote such a conveyance made to, or for the benefit of, a woman on her marriage, with remainder to her child or children, and this irrespective of whether the wife's estate was legal, and so subject to the husband's control, or equitable and as such free from his control. A marriage settlement is usually made in anticipation of a contemplated marriage, in which case it is known as an antenuptial settlement, but postnuptial settlements are also common. See HUSBAND AND WIFE; SEPARATE PROPERTY; SETTLEMENT.

MARRIED WOMAN. See HUSBAND AND WIFE; MARRIAGE; DOWER; SEPARATE ESTATE.

MAR'RIOTT, JOHN (1780–1825). An English poet. He was the son of Robert Marriott, rector of Cotesbach Church in Leicestershire, and was educated at Rugby and at Christ Church, Oxford (B.A., 1802; M.A., 1806). He left Oxford in 1804 to become tutor to George Henry, Lord Scott (died 1808), elder brother of the fifth Duke of Buccleuch. While living at Dalkeith (1804–08) he made the intimate acquaintance of Sir Walter Scott. Ordained priest in 1805, he received from the Buccleuch family the rectory of Church Lawford in Warwickshire. Though he retained this benefice till his death, he resided mostly in Devonshire, serving in various curacies. To the third edition of Scott's *Minstrelsy* he contributed three poems. Marriott's best-known poem is "Marriage is Like a Devonshire Lane" (in Joanna Baillie's *Collection of Poems*, 1823). He also wrote several popular hymns, as "Thou whose Almighty Word."

MARRONS GLACÉS, mä'rôn' glä'sā'. See CHESTNUT.

MAR'ROW (AS. *mearg, mearh*, OHG. *marag, marg*, Ger. *Mark*; connected with Welsh *mer*, Corn. *maru*, OChurch Slav. *mozgŭ*, Av. *mazga*, Skt. *majjan*, marrow, from *majj*, Lat. *mergere*, to dip). A substance filling the cells and cavities of the bones of mammals. There are two varieties, which are known as *red marrow* and *yellow marrow*. In some of the short bones, as the bodies of the vertebræ and the sternum, the marrow has a reddish color, and is found on analysis to contain 75 per cent of water, the remainder consisting of albuminous and fibrinous matter, with salts and a trace of oil. In the long bones of a healthy adult mammal the marrow occurs as a yellow, oily fluid, contained in vesicles like those of common fat, which are embedded in the interspaces of the medullary membrane, a highly vascular membrane lining the interior of the bones. This marrow consists of 96 per cent of oil and 4 of water, connective tissue, and vessels. The capillary blood vessels are very abundant, and in those of red marrow

the red corpuscles of the blood are constantly recruited. The oily matter of the marrow is composed of the same materials as common fat, with the oleine (or fluid portion) in greater abundance. Being of low specific gravity, it is well suited to fill the cavities of the bones and forms an advantageous substitute for the bony matter which preceded it in the young animal. Preparations of red bone marrow are in the market, for internal administration. They are useful in anæmia, when given with other reconstructives.

MARROW CONTROVERSY. One of the memorable struggles in the religious history of Scotland. It took its name from a book entitled the *Marrow of Modern Divinity*, published at Oxford in 1645. The authorship of the book has been attributed, though probably incorrectly, to Edward Fisher. The high evangelical character of this work, and especially its doctrine of the free grace of God in the redemption of sinners, had made it a great favorite with certain of the ministers of the Church of Scotland, and in 1718 an edition was published in Edinburgh by the Rev. James Hog of Carnock, followed in 1719 by an explanatory pamphlet. A committee appointed by the General Assembly of the same year, after an examination, drew up a report which was presented to the Assembly of 1720, and the result was the formal condemnation of the doctrines of the *Marrow*, a prohibition to teach or preach them for the future, and an exhortation to the people of Scotland not to read them. This act of the Assembly was immediately brought by Thomas Boston before the presbytery of Selkirk, who laid it before the synod of Merse and Teviotdale. The evangelical ministers in the Church, few in number, but supported by a very considerable amount of popular sympathy, resolved to present a representation to the next General Assembly (1721) complaining of the late act and vindicating the "truths" which it condemned. A commission of the Assembly of 1721 was appointed to deal with the ministers, and a series of questions was put to them, to which answers were drawn up by Ebenezer Erskine and Gabriel Wilson. These replies did not prove satisfactory, and the "Marrow-men" were called before the bar of the Assembly (1722) and solemnly rebuked. The matter was then quietly dropped, but it really occasioned the secession of 1734. See BOSTON, THOMAS; ERSKINE, EBENEZER.

MAR'RUCI'NI. An ancient people in central Italy, on a narrow tract of land along the right bank of the river Aternus, now the Pescara. Their territory extended from the Apennines to the Adriatic; it lay between the Vestini on the northwest and the Frentani on the southeast, and between the Pæligni on the southwest and the Adriatic on the northeast. They were an independent nation, said to be descended from the Sabines, and generally were in alliance with their neighbors, the Marsi and the Pæligni. They entered into alliance with the Romans in 304 B.C., but rebelled at the beginning of the Social War. Their only place of importance was Teate, now Chieti, on the right bank of the Aternus. From an inscription, of about 250 B.C., known as the Bronze of Rapino, written in the Latin alphabet, but in an Oscan dialect, something is known of the dialect of the Marrucini. See ITALIC LANGUAGES, *Marrucinian;* and consult R. S. Conway, *The Italic Dialects* (Cambridge, 1897).

MARRYAT, măr'rĭ-ăt, FLORENCE (1837–99). An English authoress, daughter of Captain Marryat. She was born at Brighton, July 9, 1837, educated at home, and began writing at 12. She was twice married, first to Col. Ross Church, of the Madras Staff Corps, and second to Col. Francis Lean, of the Royal Light Infantry. She died in London, Oct. 27, 1899. As a writer she first gained public attention by *Love's Conflict* (1865). Miss Marryat was also known as a lecturer, an operatic singer and a comedienne. In collaboration with Sir C. L. Young she wrote *Miss Chester*, a three-act drama, and in 1881 she acted the principal comedy rôle in her own play, *Her World*. Her books, fiction and miscellaneous, number some 70, none of them, probably, destined to be long remembered. Her *Life and Letters of Captain Marryat* (1872) should, however, be mentioned.

MARRYAT, FREDERICK (1792–1848). An English sailor and novelist, born in London, July 10, 1792. On leaving school he entered the navy as midshipman. In 1812 he attained his lieutenancy. In 1814 he was fighting on the American coast. His health gave way and he went home. He was made commander in 1815. In 1820 he was in the sloop *Beaver* on the St. Helena station. After an able service he resigned in 1830. During his naval career Marryat saved at great personal risk more than a dozen lives. He was rewarded on this score by a medal from the Royal Humane Society; and he was elected a fellow of the Royal Society in 1819, mainly because he had adapted Popham's signal system to the mercantile marine. He was also decorated by the King of France for "services rendered to science and navigation." Marryat wrote easily and made money quickly, but he was somewhat lavish, and towards 1844 was in straitened circumstances. Upon the Admiralty's refusal to let him reënter the service he burst a blood vessel, and six months later, when almost well, he was mortally shocked by hearing that his son Frederick had been lost in the *Avenger*. He died Aug. 9, 1848, at Langham. Among his numerous tales are the avowedly autobiographical *Frank Mildmay* (1829); then *Peter Simple* (1834); *Mr. Midshipman Easy* (1836); *The Phantom Ship* (1839); *Poor Jack* (1840); *The Privateer's Man* (1846). Consult Florence Marryat, *Life and Letters of Captain Marryat* (London, 1872), and David Hannay, *Life* (ib., 1889).

MARS (Lat., also *Marmar, Mavors,* or *Marspiter*, like Jupiter, Gk. Ἄρης, *Arēs,* of unknown derivation). Among the ancient Greeks and Romans the god of war and tumult of battle. The Greek and Roman conceptions differ radically.

Greek. Ares, though prominent in the poets, plays no large part in Greek cult or myth. It is true that a somewhat long list can be compiled of temples of the god, but he did not fill a large place in religious thought, and at but few localities was his worship important. At Thebes and Athens he seems to have been more prominent than in other communities. At Thebes he was said to have been father of the dragon who guarded his sacred spring and was slain by Cadmus (q.v.), who in the final reconciliation wedded Harmonia, daughter of Ares and Aphrodite. Here, as often in Greek legend, Aphrodite appears as the recognized consort of Ares. The connection of Aphrodite with Hephæstus, and her adultery with Ares, though told in the *Odyssey*, book viii, was not everywhere canonical,

and seems to have received its chief prominence at a late period. At Athens there was a celebrated temple of Ares, with a statue of the god, by Alcamenes, and a legend which connected him with the founding of the court of the Areopagus. (See the articles AREOPAGUS; VENUS.) He was said to have killed a son of Poseidon for an outrage on his daughter, and to have been tried by the 12 gods and acquitted on this hill, which henceforth, the Greeks said, bore his name. Cults of Ares in Thessaly and at Argos, Tegea, and Sparta are also mentioned. In legend Ares is commonly the son of Zeus and Hera, whose quarrelsome disposition he inherits. His sister in Homer is *Eris*, his sons *Deimos* (Terror) and *Phobos* (Fright), who go with him into battle. He is always greedy for war, battle, and bloodshed. The tumult of battle is his delight, and in later poets, as Sophocles, he appears as the sender of pestilence and destruction. In the Trojan War he fought with the Trojans, but he yielded to Athena, the champion of the Greeks, and was even wounded by Diomede. He was certainly closely associated in the minds of the Greeks, from Homer onward, with Thrace, and there is, to many scholars, probability in the view that his worship was derived from Thracian tribes or their kindred. Another view, supported by O. Gruppe, emphasizes the importance of Ares in Bœotian story and cult, and holds that his worship was carried thence to Thrace. In the earlier art, especially on vases, Ares is often bearded and regularly wears the full armor of a Greek soldier. In the fifth century and later this equipment disappears and the god is often represented clad in the chlamys, or nude, though usually with his attributes of shield and spear. Among the most celebrated statues are the standing "Ares Borghese" (sometimes called Achilles) in the Louvre, which goes back to a fifth-century work, and the seated "Ares Ludovisi" in Rome, which seems to be copied from a statue by Scopas (q.v.), or, according to some, from a statue by Lysippus (q.v.), though the Erotes are probably the addition of the Hellenistic copyist. Consult: O. Gruppe, *Griechische Mythologie und Religionsgeschichte*, vol. ii (Munich, 1906); A. Fairbanks, *The Mythology of Greece and Rome* (New York, 1907); the article "Ares," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

Roman. Mars was an ancient Italian deity, worshiped in all parts of central and southern Italy. To some scholars he seems everywhere to have been the god of war; others think he was originally a god of vegetation. To early peoples agriculture and war are of prime importance; both long remained of prime importance to the Romans. At Rome his worship is among the most ancient and the most important. His temple and oldest altar stood in the Campus Martius; and another famous temple was just outside the Porta Capena, to the south of the city. At each *lustrum* at the close of the census, when the *comitia centuriata*, or Roman citizens as an army, gathered in the Campus Martius (see CENSOR; COMITIA), the gathering was purified by leading around it the *suovetaurilia* (boar, ram, and bull), an offering sacred to Mars, which was afterward sacrificed, and similar ceremonies are found in connection with other purifications, as of the city, villages, and even single farms. (See AMBARVALIA.) The sacred emblems of Mars were the spear and shield, said to have fallen from heaven, which were preserved in the Regia and were carried by the Salii (q.v.), priests of the god, in their festivals. The chief festivals of Mars were in the months of March (called Martius, from the god) and October, which are clearly connected with the opening and close of the campaigning season. In legend Mars was the father by Rhea, or Rhea Silvia (q.v.), of Romulus and Remus. The wolf, a warlike beast, was sacred to Mars. So too, to some extent, were horses, which the Romans bred mainly for military purposes; the March festival in honor of Mars was known as the Equiria, and included horse racing. Augustus built in his forum a splendid temple to Mars Ultor (Mars the Avenger), because the god had helped him to avenge the death of his uncle and father by adoption, Julius Cæsar. See AUGUSTUS, FORUM OF. Consult: W. W. Fowler, *Roman Festivals* (London, 1899); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1911); and the article "Mars" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MARS. The first of the superior planets. Its mean distance from the sun is 141.5 million miles, or nearly $\frac{3}{2}$ times that of the earth; its periodic time, 686.98 days; its diameter, 4230 miles; volume, $\frac{1}{6.57}$ that of the earth; density, 0.71, earth's being unity. Its orbit is inclined at an angle of 1° 15′ 1″ to the ecliptic, and, with the exception of the orbit of Mercury, has a greater eccentricity, viz., 0.09332, than that of any other major planet. When it is nearest to the earth (i.e., in favorable opposition) its apparent angular diameter is 25″, but when farthest away (i.e., in conjunction) its diameter is not more than 4″. The axis of rotation is inclined 24° 50′ to the plane of the orbit and therefore the planet presents phenomena of seasons similar to the earth's. The diurnal rotation period of Mars is known very accurately from observations of surface markings to be 24 hours, 37 minutes, 22.67 seconds. The planet shines with a red light and is a brilliant object in the heavens at midnight when near opposition. Mars has two satellites, discovered by Hall in 1877. They are very small, and visible with powerful telescopes only. The inner satellite, Phobos, revolves around the planet at a distance of only 3760 miles from its surface in 7 hours, 39 minutes, which is less than one-third of the Martian day. Consequently, Phobos will rise in the west and set in the east, its real motion more than counterbalancing the apparent diurnal motion of Mars on its axis. The outer satellite is called Deimos; its period is 30 hours, 18 minutes, and its distance from the surface of its primary is 12,500 miles.

Beginning with the telescopic researches by Sir William Herschel, Mars has possessed special interest owing to the indication of the existence upon its surface of physical conditions not unlike those of the earth. The Martian seasons have already been mentioned. The "canal system" of Mars, suggested by Schiaparelli in 1877, has given rise to a careful study of the planet, rendered possible by the construction of our great modern telescopes. Many things seem to indicate that Mars is enveloped in an atmosphere with physical properties similar to those of the earth's atmosphere. According to observations by Lowell, at Flagstaff, Ariz., carried on for six months, this atmosphere would appear to be of remarkable clearness. Two white patches, in the

neighborhood of the poles, are very conspicuous and so brilliant that they, in the proper light of the sun, have been seen sparkling like stars. They are generally explained as accumulations of snow and ice, and this view is supported by the fact that they change with the Martian seasons.

A mixture of orange patches and gray-green markings is seen extending over more than half the surface of the planet in a central zone, almost parallel to the equator. The orange patches are assumed to be land. This assumption is based upon the similar appearance that the great deserts of the earth would present under the same conditions. Also permanent markings on these patches have been observed. The gray-green markings were at first explained to be seas and Sir William Huggins discovered water in the atmosphere of Mars, but the observations of Douglas in Arizona (1894) and Barnard at the Lick Observatory (1896) seem to disprove the aqueous character of the "seas." In 1894 Lowell and Pickering discovered, a month after the Martian vernal equinox, a dark belt connected with the south polar cap, which was explained by them as a gathering of water resulting from the melting of the cap by the summer heat. A similar appearance has been observed around the north polar cap.

Of all the markings that have been observed on the surface of Mars the "canals" have created the most interest. Since their first observation at the very favorable opposition of the planet in 1877 they have been studied carefully at later favorable oppositions. They have been described by observers as faint lines, becoming finer and straighter at closer observation, following the course of great circles, and distributed like a network over the surface of the planet. Several appear to pass through the same point, at which round spots, called lakes, are seen. Various theories have been advanced for the explanation of this "canal system." They were first taken to be waterways, and the change in their appearance was explained as due to the Martian seasons. Pickering considered them to be tracts of land rather than waterways. Lowell advanced the view that these "canals" and "lakes" constituted a system of irrigation carried out by the inhabitants of Mars for the purpose of leading the water obtained from the melting snow of the polar regions over the surface of the planet. It has been urged that the appearance of the canal system may be nothing but an optical illusion, but Lowell in 1905 obtained photographs which seem to settle decisively the question of the reality of the canals.

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MARS, märs, ANNE FRANÇOISE HYPPOLYTE BOUTET, MADEMOISELLE (1779–1847). A famous French actress. She was born in Paris. Her father was the actor Jacques Monvel; her mother was an actress, Mademoiselle Mars-Boutet. At an early age she appeared at the Comédie Française in personations of ingenuous childhood, but it was not till she had reached her twenty-fourth year that her first great success was obtained in *L'Abbé de l'épée*, in the part of the deaf and dumb girl. From that time forward, through a period of nearly 40 years, she acted through the whole range of dramatic art with a fullness of talent that never failed to present with delicacy, power, and good taste each new character in which she appeared. She was especially celebrated for her work in the ancient and classical repertory. Her last appearance was in 1841 as Célimène in *Le misanthrope* and as Araminthe in *Les femmes savantes*. She died in Paris on March 20, 1847. Her sister, Mars *aînée*, was also a well-known actress. Consult, though they are of doubtful value, the *Mémoires de Mademoiselle Mars* (Paris, 1849) and the *Confidences de Mademoiselle Mars* (ib., 1855), published by Roger de Beauvoir.

MARS, FORUM OF. A name for the Forum of Augustus. See AUGUSTUS, FORUM OF.

MARSALA, mär-sä'lä. A city in the Province of Trapani, Sicily, 102 miles by rail southwest of Palermo (Map: Italy, D 6). Though it has ruins of its ancient walls, a castle, and several fine churches, it is modern in appearance. Marsala has a Gymnasium, a technical school, an agricultural school, a city library, and a theatre. It is famous for Marsala wine, which is made by building up other wines of Sicily. The exports are wine, salt, soda, grain, and oil. Pop. (commune), 1901, 57,567; 1911, 65,451. It is on the site of the ancient Lilybæum.

MARS'BANKER, MARSH'BANKER, etc. (Dutch *marsbanker*, scad, apparently from *mars*, peddler's pack, or *mas*, crowd + *bank*, bank; so called because the fish appears in shoals). Old or local names of the menhaden (q.v.). Compare MOSSBUNKER.

MARSCHALL VON BIEBERSTEIN, mär'-shäl fŏn bē'bēr-shtīn, ADOLF, BARON (1842–1912). A German statesman and diplomat, born in Karlsruhe and educated at Heidelberg and Freiburg. He entered the judicial service of Baden, and from 1875 to 1883 was a member of the Upper House of its Parliament. In the Imperial Diet, from 1878 to 1881, he allied himself with the German Conservatives. In Baden he made a strong effort to unify Protestant opposition to the Ultramontanists; and his activity in the Empire was largely in paving the way for social reforms. After four years as Secretary of State for Foreign Affairs, an office in which he devoted himself especially to commercial treaties, he was named Prussian Minister of State in 1894. Upon his retirement in 1897 he was sent as Ambassador to Constantinople. In May, 1912, he accepted a similar position in London, but died five months later. He was recognized as Germany's ablest diplomat and was largely instrumental in influencing the Turkish government in favor of German policies.

MARSCHNER, märsh'nēr, HEINRICH (1795–1861). A German composer, born at Zittau in Saxony. In 1813 he entered the University of Leipzig to study law, but soon abandoned it in favor of music. He met Beethoven in 1817, through the medium of his patron, the Count von Amadée, and in 1823 shared with Weber the directorship of the German and Italian operas at Dresden. He succeeded Weber as kapellmeister of the Leipzig Theater, and produced on its stage

his popular opera *Der Templer und die Jüdin* (1829), which made him famous throughout Germany. *Heinrich IV und D'Aubigne* had appeared in 1819 (produced by Weber in 1820), and *Der Vampyr* (regarded as his best work) in 1828. His compositions also include a great number of songs, pianoforte pieces, part songs, and choruses, and considerable chamber music. Other operas, not mentioned above, are: *Hans Heiling* (1833), a remarkable work: *Der Bäbu* (1837); *Adolph von Nassau* (1843); *Hjarne der Sängerkönig* (1863), reproduced in 1883 as *König Hjarne und das Tyrfingschwert*. He was kapellmeister to the King of Hanover (1831–59). His music belongs to the romantic school of Weber, whom he greatly resembled in style, although in a way his ideals leaned towards the style of Wagner. His operas had a great vogue in Germany, and still remain in the repertoire of most of the provincial theatres. He died in Hanover. Consult: G. Münzer, *Heinrich Marschner* (Berlin, 1901); M. E. Wittmann, *Marschner* (Leipzig, 1905); H. Gaartz, *Die Opern Heinrich Marschners* (ib., 1912).

MARSDEN, märz'den, Samuel (1764–1838). An English missionary. He was born at Horsforth, near Leeds, July 28, 1764; was educated at the free grammar school at Hull, and began life as a tradesman at Leeds. He joined the Methodists, but, desiring to obtain a collegiate education, entered the English church; studied at St. John's College, Cambridge, and was ordained in 1793, and in 1794 sailed as chaplain to the penal colony at Parramatta, near Sydney, Australia. Receiving a grant of land and 13 convicts to till it as part payment for his services, he made it the model farm in New South Wales, and devoted the profits from it to the support of schools and missions. A mutinous spirit showing itself among the convicts, Marsden sailed for England (1807), mainly for the purpose of obtaining permission for the friends of the convicts to accompany them to the penal colony. This was refused, but his proposal that the convicts should be taught trades was well received. Having had some intercourse with the Maoris of New Zealand, and found them to be superior to the Australian natives, he endeavored, while in England, to obtain funds for the formation of a mission among them and missionaries to accompany him. Two laymen, William Hall and John King, consented to go as pioneers, and accompanied Marsden to Australia, August, 1809. They were soon followed by Thomas Kendall, and the party finally went to New Zealand in 1814. He employed these teachers in laying the foundations of a Christian civilization, frequently visited them, and in his fourth visit took with him the Rev. Henry Williams, who afterward became Bishop of a Maori district. He procured reënforcements for the mission from the English and Wesleyan churches, induced the natives to adopt a fixed form of government, provided for the preparation of a grammar and dictionary of the Maori language, and lived to see the people Christianized. He died at Windsor, May 12, 1838, and was buried in his parish at Parramatta. Consult J. B. Marsden, *Life of Samuel Marsden* (London, 1859).

MARSDEN, William (1754–1836). A British Orientalist, son of a Dublin merchant, born at Verval, Ireland. In 1771 he was appointed to the civil service of the East India Company at Bencoolen, Sumatra, became secretary to the government, and acquired a thorough knowledge of the Malay language. Having received a pension, he returned in 1779 to England, where he devoted himself to literature and published a *History of Sumatra* (1783). In 1807 he retired to private life and study, in 1812 published his *Grammar and Dictionary of the Malay Language*, and in 1818 a translation of *Marco Polo* (new ed., 1880). In 1834 he presented to the British Museum his collection of 3447 Oriental coins, and in 1835 his library of Oriental books and manuscripts to King's College. He published also *A Grammar of the Malayan Language* (1812) and *Numismata Orientalia* (1823).

MARSEILLAISE, mär'se-lāz'; Fr. pron. mär'sē'yāz'. The hymn of the French Revolution and since then the anthem of freedom in all European movements of liberation. In April, 1792, when a column of volunteers was about to leave Strassburg, the mayor of the city, Diedrich, gave a banquet on the occasion and asked an officer of artillery named Rouget de Lisle (q.v.) to compose a song in their honor. Rouget wrote the words during the night, adapting the music probably from the Oratorio *Esther*, by Jean Baptiste Lucien Grison, and calling it the *Chant de guerre de l'armée du Rhin*. On the following day it was sung with rapturous enthusiasm, and instead of 600 volunteers, 1000 marched out of Strassburg. The whole Army of the North soon took up the song. In Paris the song was unknown till the Marseilles battalion brought it to the city and sang it at the storming of the Tuileries. It was received with enthusiasm by the Parisians, who—ignorant of its real authorship—named it *Hymne des Marseillais*, which name it has ever since borne. The last and most pathetic strophe, the *stance des enfants*, was not written by Rouget de Lisle, but was added later.

The following is the first stanza, with refrain, approved in 1887 by a commission appointed by the French Minister of War to determine the exact form of the song:

Allons enfants de la patrie,
  Le jour de gloire est arrivé!
Contre nous de la tyrannie
  L'éntendard sanglant est levé (*bis*).
Entendez-vous dans ces campagnes
  Mugir ces féroces soldats?

Ils viennent jusque dans nos bras
  Egorger nos fils, nos compagnes.
Aux armes, citoyens!
  Formez vos bataillons!
Marchons, marchons! qu'un sang impur
  Abreuve nos sillons!

MARSEILLE, mär'sā'y', Folquet de. See Folquet de Marseille.

MARSEILLES, mär-sālz' (Fr. **MARSEILLE,** mär'sā'y'). The principal seaport of France, the second city of the Republic in point of population; capital of the Department of Bouches-du-Rhône, and an important military and naval station. It is on the eastern shore of an inlet of the Gulf of Lyons, 25 miles east of the principal mouth of the Rhone and 534 miles by rail southeast of Paris; lat. 43° 17′ N., long. 5° 23′ E. (Map: France, S., K 5). Its location is picturesque, the ground rising on all sides in an amphitheatre of wood-crowned hills 1200 to 1800 feet high, which terminate in a steep promontory a few miles south of the city. The immediate surroundings were formerly arid, but since the completion of the canal bringing the waters of the Durance to the city the adjoining district has been irrigated and is now covered with gardens.

Few European cities have shown such rapid modern development. A century ago the town was a cluster of narrow, crooked streets grouped around the cove which formed the old harbor. Several large avenues now traverse this old portion, while practically the whole city is laid out with broad and straight streets and generally presents a modern aspect. The city is dominated by the hill of Notre Dame de la Garde, which rises to a height of 480 feet on the southwest, between the town and the shore. This hill is encircled on the water side by a picturesque road, the Chemin de la Corniche, which leads southward along the shore of the gulf to the Anse des Catalans, a distance of 4½ miles. There is a citadel on a promontory guarding the narrow entrance to the old harbor, which as a landlocked cove reaches into the heart of the city. The harbor is also defended by the fortified islands of Ratonneau and Pomégue, and the Château d'If, the latter a former state prison immortalized by Dumas in his *Monte Cristo*. Two principal avenues crossing at right angles divide the city into four quarters. One is the Rue Cannebière, the principal business street, which begins at the head of the old harbor and is continued eastward as the Boulevard Madeleine. The other, running north and south, is the Rue de Rome, which terminates at the obelisk in the Place Castellane, whence it is prolonged as the Prado, the principal boulevard of Marseilles. This is a magnificent avenue with two double rows of trees, which runs 2 miles south and southwestward, terminating on the seashore at Parc Borély. The old town is still a labyrinth of narrow streets inhabited by a seafaring population.

Marseilles has few architectural monuments and no interesting remains of ancient times. It is an episcopal see and its most prominent building is the new cathedral, the finest modern cathedral of France, which faces the southern basin of the new harbor. It is built of Florence greenstone in the Byzantine style mixed with Romanesque and classic elements, and is surmounted by five domes. Another church worthy of notice is that of Notre Dame de la Garde, built (1853–64) on the hill of that name south of the old harbor. Its belfry, surmounted by a colossal statue of the Virgin, towers nearly 600 feet above the level of the sea and affords a splendid view of the city and the surrounding country. Among secular buildings should be mentioned the Palais de Longchamp, a magnificent Renaissance building containing various museums, the Palais de Justice, and the Exchange. The educational institutions of the city include a school of medicine and pharmacy and a faculty of sciences, which form part of the University of Aix-Marseilles, a school of engineering, a school of navigation, an independent law school, two lycées, two seminaries, a commercial high school, a school of fine arts, a conservatory of music, an astronomical observatory, botanical and zoölogical gardens, a biological laboratory, museums of art, archæology, and natural history, and a municipal library of 120,000 volumes. Besides these there are a number of scientific and literary societies. The water supply is derived from the River Durance through the Canal de Marseille, constructed 1837 to 1848, which delivers water at the rate of 9000 liters per second, sufficient both for the use of the city and for the irrigation of the surrounding country. Its total length is 97 miles, of which 13 are underground. An extensive system of drainage works was completed in 1898, by which the sewage is carried miles to sea, leaving the waters of the harbor uncontaminated. The principal industries of Marseilles are the manufacture of soap, smelting of iron and copper, the construction of steam engines and automobiles, the refining of sugar, flour milling, oil factories, tanneries, lead, tin, and copper plants, petroleum refineries, and the manufacture of candles, macaroni, and tiles and brick. It also has iron-shipbuilding and naval-equipment yards. The great development of Marseilles is due chiefly to its commerce, which was greatly enhanced by the opening of the Suez Canal. The new harbor, begun in 1844, consists of a series of basins stretching northward from the entrance of the old harbor. An auxiliary harbor has been constructed in the channel between the two islets of Pomégue and Ratonneau lying off the promontory south of the city. Here are established the quarantine and the marine hospital. There are altogether 12 miles of quays, accommodating 2500 vessels at one time, and the new harbor has a water area of 414 acres, with a depth for vessels of all classes. The old harbor of 70 acres is now used for sailing vessels. In 1902 the Chamber of Commerce voted 91,400,000 francs for a canal to the mouth of the Rhone (see CANALS, *Boat Canals*), and a canal is also projected between the Rhone and the Loire, thus bringing Marseilles into connection with northern France. In 1912 the number of ships which entered and cleared was 4464, with a tonnage of 7,850,221, of which only about one-half was French. The value in 1904 of imports and exports combined was 2,061,000,000 francs; in 1912, 3,643,100,000. The principal exports are cotton and woolen goods, ribbons, silks, sugar, grain, oil, soap, fruits, wine, candles, and bricks; the chief imports are cattle, oil seeds, coffee, raw cotton and silk, hides, and grain. The trade is chiefly with the Mediterranean countries. The United States is represented by a consul.

The population of Marseilles in 1911 was 550,619. An idea of the growth of the city may be gained from the following figures: 1789, 100,000; 1851, 195,185; 1891, 403,749; 1901, 491,161; 1906, 517,498; 1911, 550,619. The increase has been due, at least in late years, wholly to immigration, as the death rate is higher than the birth rate. The districts around the wharves are frequented by people of all nationalities, and the busy, cosmopolitan air of the city is in marked contrast with the rest of Provence.

Marseilles is popularly supposed to have been founded by Greeks from Phocæa in Asia Minor, but archæological discoveries have established the fact that a Phœnician colony preceded the Greek settlement of about 600 B.C. The Greek colony, called Massilia, soon supplanted the Phœnician, and became a flourishing commercial centre, a free city, and the mother city of a number of other Greek colonies, which spread as far west as Cape St. Martin in Spain. In the fourth century B.C. Pytheas (q.v.), a citizen of Marseilles, sailed even to Britain. Finds of coins have shown that Marseilles carried on trade, especially in wine, all through Gaul, and over the Alps to the Tirol. Since the chief trade rival of the city was Carthage, Marseilles allied itself with Rome during the Punic wars, at which time it was at the zenith of its power. Its schools were long preferred to those of Athens

for the education of Roman youths. During the civil wars it took the side of Marius and later that of Pompey. Cæsar attacked and captured it in 49 B.C. and deprived it of its powers and privileges, and from that time its decadence began, though it still remained for a long time an intellectual centre. In the Middle Ages it retained to a large degree its independence. It was finally subject to the counts of Provence, and with Provence it was united with the French crown in 1481. In 1660 Louis XIV deprived the city of its privileges. Consult: Boudin, *Histoire de Marseille* (Paris, 1852); *Société de statistique de Marseille* (Marseilles, 1837 et seq.); Teissier, *Histoire du commerce de Marseille, 1855–74* (ib., 1887); P. Castanier, *Histoire de la Provence dans l'antiquité*, vol. ii (Paris, 1896); E. Caman, *Marseille au XXème siècle* (ib., 1905).

MARSEILLES. A city in La Salle Co., Ill., 77 miles southwest of Chicago, on the Chicago, Rock Island, and Pacific and the Chicago, Ottawa, and Peoria railroads, on the Illinois River, and on the Illinois and Michigan Canal (Map: Illinois, G 3). It has excellent water power; its many manufactured products include paper boxes and cartons, roofing materials, paper box board, agricultural implements, concrete blocks, cigars, etc. There are also coal mines. A large railroad bridge spans the Illinois near here. Marseilles adopted the commission form of government in 1913. Pop., 1900, 2559; 1910, 3291.

MARSH, Anne Caldwell (c.1798–1874). An English author, born at Lindley Wood, Staffordshire. She wrote many novels, of which *Two Old Men's Tales* (1846), *Emilia Wyndham* (1846), and *Norman's Bridge* (1847) are considered the best. Most of her works were written anonymously, and it is not certain how many are rightly attributed to her. Her best work is of delicate conception, but lacks power. Several of the stories have been republished in the United States.

MARSH, George Perkins (1801–82). An American diplomatist and philologist. He was born at Woodstock, Vt.; graduated at Dartmouth College in 1820; studied law in Burlington, and in 1835 was elected to the State Legislature and became a member of the Supreme Executive Council of the State. From 1843 to 1849 he was a Whig member of Congress, and in the latter year resigned to become Minister Resident at Constantinople. In 1852 he was charged with a special mission to Greece, and having traveled extensively in Europe returned to the United States in 1854. Between 1857 and 1859 he served as railroad commissioner for Vermont, and from 1861 until his death was first United States Minister to the Kingdom of Italy. He died at Vallombrosa, Italy, and was buried in the Protestant cemetery in Rome. His publications include: *The Camel: His Organization, Habits, and Uses, Considered with Reference to his Introduction into the United States* (1856); *Lectures on the English Language* (1861); *The Origin and History of the English Language* (1862; rev. ed., 1885); *Man and Nature* (1864; enlarged in 1874 as *The Earth as Modified by Human Action;* rev. ed., 1885). His second wife, Caroline (Crane) Marsh, published one volume of the *Life and Letters of George Perkins Marsh* (New York, 1888).

MARSH, Herbert (1757–1839). Bishop of Peterborough. He was born in Faversham, Kent; graduated at St. John's College, Cambridge, in 1779, and studied theology at Leipzig. He was appointed Lady Margaret professor of divinity at Cambridge in 1807, Bishop of Llandaff in 1816, and Bishop of Peterborough in 1819. Opposing the allegorical systems of interpretation of the Fathers and the Middle Ages, he insisted that Scripture had but one sense, the grammatical, and was one of the first to introduce German methods of research into English biblical scholarship. His publications include: a translation of Michaelis' *Introduction to the New Testament* (5 vols., 1793–1801); *National Religion the Foundation of National Education* (1813); *Lectures on the Authenticity and Credibility of the New Testament* (1820–22); *On the Authority of the Old Testament* (1823); *Lectures on the Criticism and Interpretation of the Bible* (1828).

MARSH, Othniel Charles (1831–99). An American zoölogist and paleontologist. He was born in Lockport, N. Y., graduated at Yale College, and studied in Germany. Upon his return to the United States he was appointed professor of paleontology and curator of the geological museum at Yale, and held these positions until his death. Professor Marsh accomplished a great amount of valuable scientific work in the discovery and description of new fossil vertebrates from the geological formations of the Western States and Territories. In carrying out his investigations he organized many exploring expeditions at his own expense, and directed others which were equipped by the United States Geological Survey. More than 400 new fossil species of vertebrates were described by Professor Marsh, among them such interesting types as the Dinocerata (huge tapir-like animals), Pterodactyls (flying lizards), and Odontornithes (toothed birds). His discoveries of the fossil ancestors of the horse marked an epoch in evolutionary science and have been frequently employed as an illustration of the principle of evolution. The more extended and general articles by Professor Marsh were incorporated in the *Reports* and *Monographs* of the United States Geological Survey; they included: "Birds with Teeth," *Third Annual Report*, 1883; "The Gigantic Mammals of the Order Dinocerata," *Fifth Annual Report*, 1885; "The Dinosaurs of North America," *Sixteenth Annual Report*, 1896; "Dinocerata," *Monograph X;* "The Ceratopsia," *Monograph XLIX* (elaborated by J. B. Hatcher and edited by R. S. Lull). Consult G. B. Grinnell, "Othniel Charles Marsh," in *Leading American Men of Science*, edited by D. S. Jordan (New York, 1910). He served as president of the American Association for the Advancement of Science in 1878 and of the National Academy of Sciences from 1883 to 1895. The Geological Society of London, of which he was a fellow, bestowed upon him the first Bigsby medal, in 1877. He also received the Cuvier prize of the French Academy of Sciences. His valuable collection of fossil vertebrates was left to Yale University.

MARSH, Sylvester (1803–84). An American merchant, inventor, and promoter, born at Campton, N. H. In 1833 he removed to Chicago, where he became the originator of the meat-packing industry and invented many of the appliances now used in that business. In 1837, after most of his property was lost in the financial crisis, he entered the grain business and invented the dried-meal process. During a visit to his old home in 1852 he conceived the idea of a rail-

road to the top of Mount Washington, insisted upon the feasibility of the plan, and persisted until in 1858 he obtained a charter for the construction of the road, but because of the Civil War was unable to begin work until 1866. The work was completed in 1868. The cogs and brakes used on the road were invented by Marsh. Railways of a similar kind and construction were soon afterward built up Mount Rigi, Switzerland, and up Green Mountain, Mount Desert, Maine, and many others have followed.

MAR'SHAL (OF. *mareschal, marescal,* Fr. *maréchal,* from ML. *mareschalcus, mariscalcus,* from OHG. *marahscalh,* groom, master of the horse, marshal, from *marah,* AS. *mearh,* Ir., Gael. *marc,* Gk. *μάρκας, markas,* horse + *scalh,* Ger. *Schalk,* Goth. *skalks,* AS. *scealc,* obsolete Eng. *shalk,* servant). A term in English history, originally meaning a groom or manager of the horse, though eventually the King's marshal became one of the great officers of the household of the Norman and Plantagenet kings, being conjointly with the constable (q.v.) a judge in the *curiæ martiales,* or courts of chivalry, and enjoying equal rank with the Chancellor. The constable's functions were virtually abolished in the time of Henry VIII, and the marshal became thenceforth the sole judge in questions of honor and arms. The earl marshal is president of the English College of Heralds, and appoints the kings-at-arms, heralds, and pursuivants. The dignity of marshal existed formerly in Scotland, where a different orthography was adopted, and the office of marischal became hereditary in the fourteenth century in the family of Keith. In France the highest military officer is called a marshal, a dignity which originated early in the thirteenth century. There was at first only one maréchal de France, and there were but two till the time of Francis I. Their number afterward became unlimited. Originally the marshal was the esquire of the King and commanded the vanguard in war; in later times the command became supreme and the rank of the highest military importance. From the title of this class of general officers the Germans have borrowed their Feldmarschall, and the English the title of field marshal, a dignity bestowed on commanders distinguished either by elevated rank or superior talents. The title "marshal" in the United States is used: (1) to denote the ministerial officer of the United States courts, there being, with several exceptions, one appointed for each judicial district. The exceptions are the few instances where one marshal is required to perform the duties of two districts. The duties of this officer resemble those of a sheriff in the State courts; he opens and closes the sessions of the district and circuit courts, serves warrants, and executes throughout the district all lawful precepts directed to him. Marshals are also appointed for Porto Rico, Alaska, and Hawaii. (2) In many States of the South and West the marshal is the town or village police officer, and is to be distinguished from the officers of the county called sheriffs, and from the officers of the justices' courts called constables. Besides their functions in connection with the courts, the United States marshals discharge duties in connection with the administration of the internal-revenue service, public lands, the mail service, etc. They are appointed by the President with the advice and consent of the Senate for a term of four years.

MAR'SHALING. In law, the arrangement or ordering and distribution of different funds under administration so that all parties having rights as creditors or legatees therein may receive their due proportions. The principle upon which this is done is the equitable rule that a party who is entitled to satisfaction or security out of one or more of several funds or properties which must be looked to by others for their satisfaction or security shall not be allowed to elect to satisfy or secure himself so as to exclude another who is entitled to resort to only one of the funds, when the first party can otherwise sufficiently protect himself. The principle of marshaling is applied to the distribution of assets of a decedent or insolvent among legatees and creditors, as well as to the distribution of securities of various sorts among creditors who may be variously entitled to them. An instance of marshaling of assets is found in the old rule that a simple contract creditor, who was at the common law entitled to payment only out of the personal estate of a deceased person, was subrogated to the right of a specialty creditor to be paid out of real or personal assets where the latter had recovered out of the personal assets. So to-day legatees, who are, of course, entitled only to personal estate, may have their claims satisfied out of the real estate where simple contract creditors, who might now resort to the real estate, have satisfied their claims out of the personal estate and in so doing have exhausted it.

The doctrine of marshaling securities is most frequently exemplified in the case of mortgagees and others having rights, such as vendor's liens, judgment liens, etc., against the real estate of the debtor. Thus, where the owner of two estates or funds mortgages both to one person and only one of them to another person, the first encumbrancer will be required to resort in the first instance to the estate or fund on which the other has no claim. The same principle has been applied to mortgages of personal chattels, to sureties who have become liable to pay the principal debt, and in many other cases. The doctrine is an admirable example of the way in which the courts of equity work out the principle, "Equality is equity." See EQUITY; SUBROGATION.

MARSHALING OF ARMS. In heraldry, the science of arranging several coats of arms on the same escutcheon so as to indicate the relation borne by one person to others connected with him either by birth or marriage. See HERALDRY.

MAR'SHALL. A city and the county seat of Clark Co., Ill., 18 miles west by south of Terre Haute, Ind., on the Vandalia and the Cleveland, Cincinnati, Chicago, and St. Louis railroads (Map: Illinois, J 7). It has some trade and manufactures of flour, lumber, furniture, condensed milk, etc., and is in an oil and an agricultural and stock-raising district. The water works and electric-light plant are owned by the city. Pop., 1900, 2077; 1910, 2569.

MARSHALL. A city and the county seat of Calhoun Co., Mich., 108 miles by rail west of Detroit, on the Kalamazoo River and on the Michigan Central Railroad (Map: Michigan, E 6). It has the grounds of the County Agricultural Society, the Dulcenia Home for Old Ladies, and a fine high-school building, city library, and county courthouse. The city is the centre of a rich farming district, and manufactures coffee-roasting and peanut-butter machinery, hot-air

furnaces, couplers and axles, carriages and wagons, bathtubs, electrical appliances, farming implements, medicines, flour, etc. There are also marble and granite works, and roundhouses of the Michigan Central Railroad. Marshall owns and operates the water works and electric-light plants, both of which are run by water power, on a profitable basis. Pop., 1900, 4370; 1910, 4236.

MARSHALL. A city and the county seat of Lyon Co., Minn., 165 miles west by south of St. Paul, on the Redwood River and on the Great Northern and the Chicago and Northwestern railroads (Map: Minnesota, B 6). It has a public library, and among the prominent buildings are the public schools, county courthouse, and county jail. An important trade is carried on, and there are several grain elevators, a sash and door factory, a flour mill, and a creamery. The water works and electric-light plant are owned by the city. Pop., 1900, 2088; 1910, 2512.

MARSHALL. A city and the county seat of Saline Co., Mo., 84 miles by rail east of Kansas City, on the Chicago and Alton and the Missouri Pacific railroads (Map: Missouri, C 2). It is the seat of Missouri Valley College (Presbyterian), founded in 1889, and Academy Notre Dame de Sion (Catholic), and has a handsome courthouse, United States government building, and a State institution for the feeble-minded and epileptics. Marshall is near deposits of coal, salt, and building stone, and carries on an important trade, and manufactures flour, shoes, creamery products, lumber, brick and tile, carriages and wagons, and canned goods. The water works are owned by the city. Pop., 1900, 5086; 1910, 4869.

MARSHALL. A city and the county seat of Harrison Co., Texas, 42 miles west of Shreveport, La.; on the Texas and Pacific and the Marshall and East Texas railroads (Map: Texas, E 3). It is the seat of Wiley University (Methodist Episcopal) and Bishop College (Baptist) for negroes, and has a fine courthouse, city hall, high school, Carnegie library, and opera house. The city is in a fertile agricultural region adapted particularly for fruit and vegetable cultivation, and the vicinity possesses valuable oak and pine forests. Among the industrial enterprises are a foundry and machine shops, cotton compress, saw and planing mills, brickyards, fertilizer factory, pottery plant, carriage works, railroad shops of the Texas and Pacific and Marshall and East Texas railroads, carwheel works, etc. The water works are owned and operated by the municipality. Marshall has adopted the commission form of government. Pop., 1900, 7855; 1910, 11,452; 1914 (U. S. est.), 12,984; 1920, 14,271.

MARSHALL, Alfred (1842–). An English economist, born in London. From the Merchant Taylors' School he passed to St. John's College, Cambridge, where he graduated with distinction in 1865. In 1877 he became principal of University College, Bristol, and in 1883–84 was lecturer and fellow of Balliol College, Oxford. From 1885 to 1908 he served as professor of political economy at Cambridge. In 1891 he was appointed a member of the Royal Commission of Labor. With his wife he published (1879) *Economics of Industry*. His *Principles of Economics* (1890) won for him the position of one of the foremost of English economists. In this work he seeks to present and reconcile the essential doctrines of classical and modern economics. He published also: *Present Position of Economics* (1886); *Elements of Economics* (1891); and numerous articles in scientific and popular periodicals.

MARSHALL, Arthur Milnes (1852–93). An English naturalist, born at Birmingham. He received his B.A. degree from London University at the age of 18 and then went to Cambridge, where he graduated in 1874. In the following year he was sent by that university to the zoölogical station at Naples. Upon his return he began the study of medicine, but in 1879 became professor of zoölogy at Owens College, Manchester. He was made a fellow of the Royal Society in 1885, a councilor of the same in 1891–92, and presided over a section of the British Association in 1892, but was particularly distinguished as a teacher and organizer. He started the biological classes at Victoria University, and contributed much to the scientific knowledge of embryology in his technical publications, especially the *Quarterly Journal of Microscopical Science*, and in separate memoirs. Among his writings are: *The Segmental Value of the Cranial Nerves* (1882); *The Frog* (1882; 10th ed., 1909); *A Junior Course of Practical Zoölogy* (1887; 5th ed., 1899), with C. H. Hurst; *Vertebrate Embryology* (1893). He lost his life in the Alps. His *Biological Essays and Addresses* were collected and published posthumously in 1894, as well as his memoir upon *The Darwinian Theory*.

MARSHALL, Emma (1832–99). An English novelist, born near Cromer in Norfolk, England, the youngest daughter of Simon Martin, a Norwich banker. She was educated in a private school at Norwich. In 1854 she married Hugh Graham Marshall, and thereafter lived an uneventful life at Wells, Exeter, Gloucester, and Bristol. She died at Clifton, May 4, 1899. Beginning with *Edith Prescott* (1863), she produced during her long career more than 100 volumes of tales, mostly for the young. Especially popular—several of them were translated into German—were those in which appeared well-known historical characters, as Sir Philip Sidney and Sir Thomas Browne. Among her latest novels were: *In Colston's Days, a Story of Old Bristol* (1883); *The Tower on the Cliff* (1886); *Penshurst Castle, in the Time of Sir Philip Sidney* (1893); *In the Choir of Westminster Abbey in the Time of Henry Purcell* (1897); *Under the Dome of St. Paul's in the Time of Christopher Wren* (1898). She also wrote verse.

MARSHALL, Francis Albert (1840–89). An English playwright, born in London, November, 1840. He was educated at Harrow and studied at Exeter College, Oxford, but left without a degree. He became a clerk in the audit office of Somerset House and began writing for newspapers and periodicals. In 1868 he resigned his post and subsequently joined the staff of the London *Figaro* as dramatic critic. He was already known for his comedies and farces: *Mad as a Hatter* (1863); *Corrupt Practices* (1870), which were followed by *Q. E. D., or All a Mistake* (1871); *False Shame* (1872); *Brighton* (1874); *Lola* (1881), a comic opera; and several others. For Henry Irving he made a version of *Werner* (1887). He was general editor of the Henry Irving Edition of Shakespeare (1888–90), and had earlier published *A Study of Hamlet* (1875) and *Henry Irving, Actor and Manager* (1883).

MARSHALL, Henry Rutgers (1852–).

An American architect and psychologist. He was born in New York City; graduated from Columbia University in 1873 (A.M., 1876); and became a practicing architect in New York in 1878. He lectured on æsthetics at Columbia in 1894–95 and at Princeton in 1915–16. Though Marshall achieved success as an architect and was president of the New York chapter of the American Institute of Architects (1902–04), he became better known perhaps as a psychologist. Rutgers and Hobart colleges gave him honorary degrees. He served as president of the American Psychological Association in 1907. His writings include: *Pain, Pleasure, and Æsthetics* (1894); *Æsthetic Principles* (1895); *Instinct and Reason* (1898); *Consciousness* (1909); *War and the Ideal of Peace* (1915).

MARSHALL, Humphrey (1722–1801). An American botanist, born in West Bradford (Marshallton), Pa. He learned the trade of a stonemason, but about 1748 turned to farming, and began to cultivate his scientific tastes, which he had ample means of gratifying through the acquisition of property in 1767, and six years afterward he was instrumental in the formation of the botanic gardens at Marshallton. He held several local offices, was made a member of the American Philosophical Society (1786), and published *Arboretum Americanum* (1785), a catalogue of the trees and shrubs of America, which was translated into French.

MARSHALL, Humphrey (1756–1841). An American statesman, cousin of Chief Justice John Marshall, born in Westmoreland Co., Va. He received very little schooling, entered the Continental army during the Revolution, and attained the rank of captain. Before the close of the war he removed to Kentucky and settled in 1780 near Lexington, where he studied law and was admitted to the bar. In 1787 he was a delegate to the convention held at Danville to consider the question of separating Kentucky from Virginia, and strongly opposed that project. He soon became known as one of the strongest Federalist leaders in the Kentucky region. In 1788 he was a delegate to the Virginia convention that ratified the Constitution. He had an inborn dislike for James Wilkinson (q.v.), whom he seems to have suspected of intriguing with the Spaniards in Louisiana from the first, and for a decade or more occupied the position of a sort of "watchdog" of Federal interests in Kentucky and was active in opposing and exposing the numerous Spanish intrigues and plans for attacking the Spanish or French at New Orleans. He opposed the plan of George Rogers Clark for an expedition against the Spaniards in 1793, declaring it was a part of the scheme of Genet (q.v.), and would only have the effect of embroiling the country with a friendly power. From 1795 to 1801 he was a United States Senator from Kentucky. His letters to the *Western World* signed Observer, in which he clearly pointed out the existence of the Burr conspiracy, led to Federal action and the thwarting of Burr's plans of empire. While a member of the State Legislature in 1809 he fought a duel with Henry Clay in which both were wounded. He published a *History of Kentucky* (1812; 2 vols., 1824), which is in reality a curious and partisan piece of autobiography, but contains much of value in regard to early politics in the West.

MARSHALL, Humphrey (1812–72). An American soldier and politician, grandson of Humphrey Marshall (1756–1841), born at Frankfort, Ky. He graduated at West Point in 1832, but resigned from the army the next year. He studied law and practiced in Frankfort and in Louisville, where he took much interest in the State militia, raising a company of volunteers for service against the Indians on the Texas frontier. At the outbreak of the Mexican War he entered as colonel of a Kentucky volunteer cavalry regiment and led the charge at Buena Vista. He was a Whig member of the United States House of Representatives in 1849 and was reëlected in 1851, but resigned in 1852 and accepted the post of Commissioner to China. He retired in 1854, and the next year again entered the House of Representatives, on the American ticket (see American Party; Know-Nothings), and served until 1859. At the beginning of the Civil War he entered the Confederate army as brigadier general and commanded in eastern Kentucky. He was in command of the Confederates at the battle of Middle Creek (1862) and in the same year defeated Gen. Jacob Cox at Princeton, Va. He resigned from the army to practice law in Richmond, but was elected one of Kentucky's representatives in the Confederate Congress, serving on the military committee, and was afterward reëlected. After the war he resumed the practice of law in Louisville.

MARSHALL, John (1755–1835). The most famous of American jurists, for 34 years Chief Justice of the United States Supreme Court. He was born Sept. 24, 1755, in Fauquier Co., Va.; studied under a private tutor; then attended an academy in Westmoreland County; and studied law until the outbreak of the Revolution, when he entered the army as a volunteer. He soon rose to the rank of first lieutenant, and by 1777 was a captain. His first fight was near Norfolk; he afterward served in the New Jersey campaign, was at Valley Forge during the memorable winter of 1777–78, and participated in the battles of Brandywine, Germantown, and Monmouth, and in the capture of Stony Point. During most of 1780, while without a command, he attended the law lectures delivered by the famous Chancellor George Wythe at William and Mary College. The following year he was admitted to the bar of Fauquier County, where he practiced for two years. In 1782 he was elected to a seat in the Virginia Legislature and soon became a member of the Executive Council. In the meantime he had removed to Richmond. In 1784 he was again elected to represent Fauquier County in the Legislature. In 1787 he was chosen to represent Henrico, the county in which he had lately taken up his residence, and in the following year was a delegate to the State convention which was called to ratify the Federal Constitution. The distinction of securing the adoption of the Constitution by Virginia belongs to Marshall and Madison perhaps more than to any others. Marshall's refutations of Patrick Henry's arguments against adoption were particularly effective. In the meantime his law practice was rapidly increasing, and he declined a reëlection to the Legislature in 1792 in order to devote his whole time to his practice, but in 1795 he was again persuaded to stand for reëlection and was successful. It was about this time that Marshall appeared before the Supreme Court in the famous case of Ware *v.* Hilton, in which the validity of the Virginia Sequestration Act was involved, and his able argument added greatly to

his growing reputation. He declined to accept the post of Attorney-General or the French mission tendered him by President Washington, but finally consented to go to Paris in 1797 with C. C. Pinckney and Elbridge Gerry to induce the Directory to remove the restrictions which it had laid on American commerce. Although the negotiations proved fruitless, Marshall's conduct seems to have been more satisfactory to the government than that of either of his colleagues. In 1798 he declined to accept a seat on the bench of the United States Supreme Court as the successor of James Wilson, but in the same year at the solicitation of Washington became a candidate for Congress and was elected, although his constituency was decidedly Anti-Federalist in politics. In Congress he supported the administration in particular and Federalist measures generally, although he voted for the repeal of the obnoxious Alien and Sedition Acts. His most notable effort in Congress was a speech in support of the conduct of the President in surrendering Jonathan Robbins, the murderer of a man on a British frigate, who had escaped to the United States and had been delivered up to the British government by the President. Marshall showed conclusively that the surrender of Robbins was clearly within the President's constitutional power. In May, 1800, he was invited by President Adams to take the office of Secretary of War, but declined. However, he accepted the position of Secretary of State, which he held for a short time. On Jan. 31, 1801, he was commissioned Chief Justice of the United States Supreme Court. The accession of Marshall to the bench of the Supreme Court as Chief Justice marks a turning point in his life and an epoch in the legal and constitutional history of the United States. He died July 6, 1835, at Philadelphia, whither he had gone for medical treatment. For 34 years Marshall dominated the court by his great learning, his masterful power of analysis and clearness of statement. Perhaps no judge ever excelled him in the capacity to hold a legal proposition before the eyes of others in such various forms and colors. He resolved every argument by the most subtle analysis into its ultimate principles, and then applied them to the decision of the case in question. His service on the bench, which continued until his death, was effective and conspicuous not only in securing for the court the recognition and profound respect for which hitherto there had been no especial occasion, but also in so expounding the Constitution as to make clear for the first time the nature of the national government and to forecast the lines along which, in actual development as well as in judicial interpretation, the nation was to proceed. In the period of Marshall's predominance the court upheld the Federalist theories, as in the national bank case of McCulloch *v.* Maryland, and gave a clear definition of the relations of the State and national governments. On the subject of the constitutional prohibition against the impairment of contracts, several noteworthy opinions were rendered by him, culminating in the famous Dartmouth College case, the soundness of which has more recently been questioned. Particularly in the field of constitutional law the work of Marshall forms the greatest contribution to American jurisprudence made by any judge. In a single decision, the famous case of Marbury *v.* Madison (1 Cranch, 137), he established the authority of the Federal courts to set aside an act of Congress on the ground of its unconstitutionality, and thus he placed on a firm footing the principle of judicial supremacy. His interpretations of the Constitution have long been recognized as an important and permanent feature of American public law. In the field of international law, also, his contribution was very great, as witness especially his opinion in Schooner Exchange *v.* McFaddon (7 Cranch, 116). This aspect of Marshall's importance had not been widely appreciated until it was discussed by John Bassett Moore in *John Marshall* (Boston, 1901). Mr. Moore says that from 1790 to 1801 only six decisions involving Constitutional questions had been rendered by the Supreme Court; from 1801 to 1835 there were 62, of which 36 were written by Marshall. During his period of service there were 195 cases involving points of international law, and Marshall delivered the opinion in 80 of these. Aside from his judicial labors, Marshall wrote a *Life of George Washington* (5 vols., 1804–07; 2d ed., 2 vols., 1832). His introduction to this work, *A History of the Colonies Planted by the English on the Coast of North America,* was published separately in 1824. *John Marshall, Complete Constitutional Decisions,* edited by J. M. Dillon, appeared in 1903 (Chicago), and *The Constitutional Decisions of John Marshall,* edited with introductory essay by J. O. Cotton, Jr., in 1905 (2 vols., New York). Consult also: A. B. Magruder, *John Marshall* (Boston, 1885; new ed., 1908); Henry Hitchcock, in T. M. Cooley et al., *Constitutional History of the United States as Seen in the Development of American Law* (New York, 1887); J. F. Dillon, *John Marshall* (3 vols., Chicago, 1903); H. Flanders, *Life of John Marshall* (Philadelphia, 1905); J. E. Oster, *The Political and Economic Doctrines of John Marshall; also his Speeches, Letters, and hitherto Unpublished and Uncollected Writings* (New York, 1914).

MARSHALL, John (1818–91). An English anatomist and surgeon. He was born at Ely, Cambridgeshire, and was educated at University College, London, where he became a demonstrator in surgery in 1845, assistant surgeon at the hospital in 1847, surgeon and professor of surgery in 1866, and consulting surgeon in 1884. He became also professor of anatomy at the Royal Academy in 1873, and was president of the Royal College of Surgeons in 1883. In surgery he introduced the galvanocautery and the operation for the excision of varicose veins. He showed great ability as a teacher of anatomy to art students. His publications include: *A Description of the Human Body, its Structure and Functions* (1860; 4th ed., 1883); *Anatomy for Artists* (1878; 3d ed., 1890); *The Outlines of Physiology, Human and Comparative* (3 vols., 1867).

MARSHALL, Louis (1856–). An American lawyer, born at Syracuse, N. Y. He studied at Columbia Law School; began practice at Syracuse in 1878; and later became a member of the firm of Guggenheimer, Untermyer, and Marshall, of New York City. He lectured at New York Law School in 1900 and at the Law School of Syracuse University in 1901; was appointed chairman of the New York Immigration Commission by Governor Hughes in 1908; served as mediator in settling the cloak makers' strike in 1910; and was counsel for Governor Sulzer in his impeachment trial in 1913 and for Leo M.

Frank in Georgia in 1914–15. Marshall was a leader in the movement which brought about the abrogation in 1911 of the Treaty of 1832 with Russia; under the treaty the Russian government had found it possible to discriminate against Russian Jews who had become naturalized citizens of the United States. Marshall identified himself actively with Jewish educational and institutional work. In 1913 he received the honorary degree of LL.D. from Syracuse University, of which he became trustee in 1910 and to which he presented a law library.

MARSHALL, Orsamus Holmes (1813–84). An American lawyer and historical writer. He was born at Franklin, Conn., graduated at Union College in 1831, studied law, spending some time at Yale, and entered upon active practice, having been admitted to the bar at Buffalo in 1834. His interest in literary and historical subjects was early manifested. He was one of the founders of the Buffalo Female Academy and of the Buffalo Historical Society, and for many years was chancellor of the University of Buffalo. His historical writings concern chiefly the relations of the Iroquois with French and English and are of considerable value. A volume was collected after his death entitled *Historical Writings of Orsamus H. Marshall Relating to the Early History of the West* (1887).

MARSHALL, Robert (1863–1910). A Scottish playwright. He was born in Edinburgh and was educated at St. Andrews and Edinburgh universities. In 1886 he was commissioned a lieutenant in the West Riding Regiment; served as district adjutant in Cape Town in 1893–94; was promoted to captain in 1895; and was aid-de-camp to the Governor of Natal from 1895 to 1898, when he retired from the army. His plays include: *The Shades of Night* (1896); *His Excellency the Governor* (1898); *The Broad Road* (1898); *A Royal Family* (1899); *The Noble Lord* (1900); *The Second in Command* (1900); *There's Many a Slip* (1902); *The Haunted Major* (1902); *The Unforeseen* (1902); *The Duke of Killiecrankie* (1904); *Everybody's Secret* (1904); *The Lady of Leeds* (1905); *The Alabaster Staircase* (1906).

MARSHALL, Stephen (c.1594–1655). A Presbyterian leader. He was born at Godmanchester, Huntingdonshire, England, graduated B.A. at Cambridge (1618), entered the ministry and joined the ranks of the Nonconformists. He was an eloquent man, considered in some quarters the greatest preacher of the day; not learned or original, but influential because of his personality and eloquence. Beginning with the advocacy of a reform of the Church of England, while retaining episcopacy and liturgy, he ended with the *de jure divino* Presbyterian theory. He was one of the leaders of the Westminster Assembly (1643 et seq.). Marshall published many sermons. One treatise, *A Defense of Infant Baptism* (1646), may be mentioned. He was also one of the joint authors of a pamphlet published at London (1641), called *An Answer to a Booke* [by J. Hall, Bishop of Norwich] *entituled An Humble Remonstrance. In which the originall of Liturgy* [and] *Episcopacy is Discussed. And Quæres Propounded Concerning Both. Written by Smectymnuus.*

MARSHALL, Thomas Riley (1854–). An American lawyer and public official, descended from the famous John Marshall family of Virginia. He was born at North Manchester, Ind., was educated at Wabash College (A.B., 1873; A.M., 1876), and studied law in the office of Judge Olds of Fort Wayne, being admitted to the bar in 1875. He practiced law at Columbia City, where as a member of the firm of Marshall and McNagny and later, in 1892, of Marshall, McNagny, and Clugston, he attained success. His practice extended beyond his county, and he became known as an orator. In 1880 he was a candidate for district attorney, but was defeated; from 1896 to 1898 he was chairman of the Democratic committee of his congressional district; and in 1908 he was nominated for Governor and was elected. Although a conservative in his belief in the maintenance of traditional political institutions, he had a progressive administration, advocating the direct election of Senators, an employers' liability law, and anti-race-track and bookmaking legislation. His efficiency in office and his alleged opposition to the Taggart faction—an opposition which, however, did not reach an open rupture—brought him favorable national attention. In 1912 he was the "favorite son" candidate of Indiana for the presidential nomination, and, while unsuccessful in this ambition, he was given that for Vice President. He proclaimed himself a "progressive with the brakes set." After his election he consistently supported the Wilson administration. In 1913 certain of his speeches regarding the social unrest growing out of discontent with the present distribution of wealth, in which he was reported as advocating revolutionary ideas respecting inheritance of property, occasioned surprise and criticism, partly through misunderstanding. He received honorary degrees from Wabash College, Notre Dame University, and the University of Pennsylvania. See Indiana, *History*.

MARSHALL, William Calder (1813–94). A Scottish sculptor. He was born in Edinburgh, March 18, 1813. He studied sculpture at the Trustees' Academy, Edinburgh, and in London, under Chantry and Bailey. In the schools of the Royal Academy he won a gold medal and traveling scholarship, and from 1836 to 1838 continued his studies in Rome. His work was chiefly idealistic statuary, and among his productions of this class are: "The Creation of Adam" (1842); "Christ Blessing Little Children" (1844); "Paul and Virginia" (1845); "Sabrina" (1846), perhaps the most popular of all his figures; and the group "Agriculture" on the Albert Memorial. In historical figures he modeled the bronze statue of Sir Robert Peel in Manchester, and in Westminster Palace the busts of Chaucer, Lord Clarendon, and Lord Somers. In decoration he was extensively engaged in the ornamentation of the new Houses of Parliament and the Wellington Chapel in St. Paul's Cathedral. His work is in the pseudoclassic style of his day, but is marked by simplicity and refinement and elegance of design. He died in London, June 16, 1894.

MARSHALL, William Louis (1846–1920). An American soldier and engineer, born at Washington, Ky. He attended Kenyon College, Ohio, in 1859–61; served as a private in the Tenth Kentucky Cavalry in 1862–63; and graduated from the United States Military Academy in 1868. Entering the engineering branch of the service, he was promoted through the various grades to brigadier general and chief of engineers in 1908. He was acting professor of natural and experimental philosophy at West Point in 1870–71. While in charge of the Colo-

rado section of the "Explorations West of the 100th Meridian" in 1872–76 he discovered (1873) Marshall Pass across the Rocky Mountains and the gold placers of Marshall Basin on the San Miguel River, Colo., in 1875. He had charge of levee construction and improvements on the Mississippi River in 1881–84, and thereafter until 1900 of harbor improvements on Lake Michigan and river improvements in Illinois and Wisconsin. He superintended also the construction of the Hennepin Canal (1890–1900), of the Ambrose channel entrance to New York harbor, and of fortifications for that harbor. As chief engineer he had charge of all the river and harbor and fortification works of the United States from 1908 to 1910, when he was retired.

MARSHALL ISLANDS. An archipelago in Micronesia, situated east of the Caroline Islands and belonging to Germany since 1885 (Map: Australasia, J 2). It consists of two parallel chains of atolls, the Ratak chain of 13 islands in the east and the Ralik of 11 islands in the west, with an aggregate area of 158 square miles. The islands are low, the water supply scanty, and the soil very poor, supporting a scanty flora, in which the coconut and the breadfruit tree predominate. The chief export is phosphate, which in 1910 appeared in the statistical returns with a valuation of 8,561,000 marks. The population of the whole archipelago in 1910 was about 15,000, of whom 179 were Europeans, 91 being Germans. The islands are administered by an Imperial Commissioner residing on the island of Jaluit. These islands were occupied by the Japanese during the war which broke out in Europe in 1914. See WAR IN EUROPE.

MAR'SHALLTOWN. A city and the county seat of Marshall Co., Iowa, 60 miles by rail northeast of Des Moines, on the Iowa River and on the Chicago Great Western, the Minneapolis and St. Louis, and the Chicago and Northwestern railroads (Map: Iowa, E 2). It is the seat of the Iowa State Soldiers Home and has a public library. It is a shipping point for large quantities of grain, and among its industrial establishments are extensive meat-packing plants, manufactories of steel furnaces and steam specialties, flour mills, grain elevators, canning and bottling works, and carriage factories. The surrounding region is adapted to agriculture and stock raising. Settled in 1860, Marshalltown was incorporated as a town in 1865 and received a charter as a city of the second class in 1868. The commission form of government was adopted in 1912. The city owns and operates the water works and electric-light plant. Pop., 1890, 8914; 1900, 11,544; 1910, 13,374; 1914, (U. S. est.), 14,042; 1920, 15,731.

MARSHAL'S COURT. See CHIVALRY, COURT OF.

MAR'SHALSEA. A former prison in Southwark, London, connected with a court of the same name. It was abolished in 1849.

MARSHBANKER. See MARSBANKER.

MARSH-CALD'WELL, MRS. ANNE (1791–1874). An English novelist, daughter of James Caldwell, of Linley Wood, Staffordshire. In 1817 she married Arthur Cuthbert Marsh, of Eastbury Lodge, Hertfordshire. Encouraged by Harriet Martineau, she published *Two Old Men's Tales* (1834). In the course of a few years she took rank among the popular novelists of her time. She published anonymously, and a complete list of her novels has never been made. Fifteen volumes appeared in the *Parlour Library* (1857). They depict mostly the manners of the upper middle class and the lower aristocracy. *Emilia Wyndham* (1846) seems to be one of the best.

MARSH CROCODILE. See MUGGER.

MARSHES. See WASTE LAND.

MARSH'FIELD. A town in Coos Co., Ore., 10 miles north of Coquille; situated on Coos Bay, on the Coos Bay, Roseburg, and Eastern Railroad, and on the lines of the Inter-Ocean Transportation Company, the Northern Pacific Steamship Company, and the Southern Pacific Steamship Company (Map: Oregon, A 4). Marshfield has a navigable channel 300 feet wide and 25 feet deep. Features of interest in the town and the vicinity are the Carnegie library, Golden and Silver Falls, and the Ten Mile Lakes. The chief industries are lumbering, coal mining, fishing, dairying, and market gardening; and there are also manufactories of myrtle-wood novelties, pulp, paper, veneered woods, boxes, boats, and doors and sashes. Pop., 1900, 1391; 1910, 2980.

MARSHFIELD. A city in Wood Co., Wis., 175 miles northwest of Milwaukee, on the Chicago and Northwestern and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Wisconsin, C 4). Among the noteworthy features are the public library, hospital, city hall, county asylum buildings, experiment farm, and three parks. Marshfield has extensive manufactures of lumber, including staves, headings, barrels, and furniture, also beds, springs, mattresses, veneer, foundry products, metal goods, gasoline engines, creamery products, etc. Dairying has assumed a position of great importance in recent years. There is also some trade in grain and live stock. The city owns its electric-light and power plant. Pop., 1900, 5240; 1910, 5783. Marshfield was almost entirely destroyed by fire in 1888, but has been rebuilt completely.

MARSH GAS. See METHANE.

MARSH HARE, or **RABBIT.** A hare (*Lepus*, or *Sylvilagus, palustris*) of the lowlands along the southern Atlantic seaboard, which is slightly larger than the cottontail, measuring 18 inches, and differs in its nearly bare feet and more scanty pelage. It frequents boggy lands, and readily takes to the water.

MARSH HAWK, or HEN HARRIER. A bird of prey (*Circus cyaneus* of Europe, or *Circus hudsonius* of North America) which haunts marshy places. The adult male is light bluish gray, the tail is barred with six to eight bands, and the tips of the wings are blackish. The female is dusky or rusty brown, streaked about the head. Both sexes may be easily recognized by the broad white patch on the rump. Though long-winged and capable of strong flight, it is habitually slow in its movements, sweeping back and forth over low meadows, river margins, and wet ground generally, in search of the small game to be found in such places, keeping near the ground and dropping suddenly upon its prey —more often a frog or a mouse than anything else. Only rarely does it seize a bird or disturb poultry; and its services are of great value to the agriculturists and should be encouraged. It was classed as "ignoble" in falconry. These hawks nest upon the ground in some marsh, and lay four or five nearly globular, dirty-white eggs. Consult: Elliott Coues, *Birds of the Northwest* (Washington, 1874); Fisher, *Hawks and Owls of the United States* (ib., 1893); Chandler, "Modifications and Adaptations to

Function in the Feathers of *Circus hudsonius*" in *University of California Publications in Zoölogy* (Berkeley, 1914); and standard authorities. See Plate of EAGLES AND HAWKS.

MARSH HEN, or MUD HEN. A gunner's name for various rails, coots, and gallinules (qq.v.).

MARSH MALLOW. A name applied to *Althæa officinalis*, native of Great Britain and naturalized in the United States, in both of

MARSH MALLOW (*Althæa officinalis*).

which countries it grows in meadows and marshes, particularly near the seacoast. The whole plant, which is a woody herb, abounds in mucilage, especially in the perennial root, confections made from it being known as *pâtes de guimauve*. The leaves and tender twigs have been used for food in some regions during seasons of scarcity. The hollyhock (*Althæa rosea*) is an allied species. See HOLLYHOCK; ALTHÆA.

MARSH'MAN, JOSHUA (1768–1837). An English missionary. He was born at Westbury Leigh, Wiltshire, and was sent in 1799 by the Baptist Missionary Society to India to join William Carey (q.v.) and his colleagues. They established their mission at Serampur, a Danish colony, 16 miles above Calcutta, and to supplement the scanty funds sent out by the society schools were opened for both European and native children. This course did not meet the approval of the society, and in 1826 Marshman returned to England to try to effect a settlement of the differences. He failed in his object, and the matter ended in a separation of the Serampur mission for the society. He returned to Serampur in 1829 and died there, Dec. 5, 1837. In addition to his special missionary duties Dr. Marshman gave himself with great zeal to the study of the Bengali, Sanskrit, and Chinese languages, and became an extraordinary linguist. He published: *A Dissertation on the Characters and Sounds of the Chinese Language* (1809); *The Works of Confucius, Containing the Original Text with a Translation* (1809); *Clavis Sinica* (1814); *Elements of Chinese Grammar, with a Preliminary Dissertation on the Characters and Colloquial Medium of the Chinese* (1814). He also prepared the first complete Chinese version of the Bible. He assisted Dr. Carey in preparing a Sanskrit grammar and a Bengali and English dictionary and the Bible in Telugu. Consult J. C. Marshman, *Life and Times of the Serampur Missionaries* (London, 1859), and Carey, *Marshman and Ward*, an abridgment of the above (ib., 1864).

MARSH MAR'IGOLD, *Caltha*. A genus of plants of the family Ranunculaceæ. *Caltha palustris*, usually called cowslip in the United States, is a very common American plant, with kidney-shaped, shining leaves and large yellow flowers, a principal ornament of wet meadows and the sides of streams in spring. It partakes of the acridity common to the order; but the flower buds, preserved in vinegar and salt, are said to be a good substitute for capers. The plant is used before flowering as a potherb

MARSH MARIGOLD (*Caltha palustris*).

in many places. A species, *Caltha natans*, occurring in ponds from Minnesota northwestward, has white or pink flowers.

MARSH PLANTS. See SWAMP.

MARSH ROSE'MARY. A name given to several species of *Statice* or *Limonium*, members of the family Plumbaginaceæ. *Statice limonium*, a perennial plant, grows in salt marshes along the seashore of southern and western Europe, and *Limonium carolinianum*, an American plant, grows in similar localities on the American coast. Marsh rosemary has a tuft of spatulate oblong, bristly pointed, one-ribbed leaves, developing in August a much-branched, panicled scape, from 1 to 2 feet high, bearing numerous small lavender-colored flowers.

MARSH'S TEST. See ARSENIC.

MARSH TREFOIL. A plant widely distributed in northen latitudes. See BUCK BEAN.

MARSH WREN. A wren that inhabits reedy marshes. In the United States and Canada two species are more or less numerous wherever such marshes occur. The most familiar one along the Atlantic coast is the long-billed marsh wren (*Telmatodytes palustris*), while the short-billed (*Cistothorus stellaris*) is more numerous in the interior of the country. Both are brownish above and light colored below, with little to distinguish them besides the marked difference in the length of the bill; but the long-billed is the larger. Both species are migratory, and are notorious for their excited activity, micelike manners, and rippling prattling song. They construct large globular nests, suspended among

the reeds, woven of grass blades and entered by a little hole in the side. As often happens among other wrens (see WREN), many more nests will be built each season than there are pairs in the locality, some of which may be utilized as sleeping places by the cock birds. The nests of the two species are much alike, but the eggs are very distinct, those of the long-billed being dark chocolate in color, while those of the short-billed are pure white.

MAR'SI. 1. An ancient tribe of central Italy, inhabiting the district around Lake Fucinus (Lago di Celano, now drained). Their origin, like that of other Italian tribes, is involved in obscurity and fiction. They were probably of Sabine origin, but spoke a dialect akin to the Latin. They are worthy of notice chiefly on account of their warlike spirit. The Marsians were at one time allies of the Romans, but in 308 B.C. they revolted and joined the Samnites. After being subdued they again (301 B.C.) shook off the alliance of Rome, but were beaten in the field and lost several of their fortresses. From this time they continued the firm allies of Rome, contributing by their valor to her triumphs until the Italians were aroused in 91 B.C. to demand redress of their wrongs and a share in the privileges of Roman citizens. A war ensued, generally known as the Social War (q.v.), but frequently called the Marsic War, because the Marsi were prominent among the malcontents. Their leader was Pompædius Silo. Though they were often defeated, the perseverance of the allies gained, in 87 B.C., the object for which they had taken up arms—enfranchisement as Roman citizens. The Marsians, inhabiting a mountain district, were temperate in their habits, brave, and unyielding. So marked was their valor that there was a proverbial saying recorded by Appian, "that Rome had achieved no triumph *over* the Marsi, or *without* the Marsi." The ancient Marsi were represented as enchanters, able to tame serpents and to heal their bites; and it is worthy of note that the jugglers who now amuse the people by handling serpents are natives of the region in the vicinity of Lago di Celano. Inscriptions found at the southwest corner of Lake Fucinus testify to the existence there of a temple and grove of Angitia, a goddess of healing, especially skilled in curing, by charms and herbs, the bites of serpents. Their only important town was Marruvium (San Benedetto), the ruins of which are still visible. Consult: Sophus Bugge, *Italische Landet Kunde* (Christiania, 1878); R. S. Conway, *The Italic Dialects* (Cambridge, 1897); and the article "Marsi" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914). See ITALIC LANGUAGES.—2. An ancient people of Germany, according to Tacitus, *Germania*, chap. ii. In books i–ii of his *Annales* Tacitus makes the Marsi an important tribe or group of tribes between the rivers Lippe and Ruhr, perhaps near Dortmund. They fought with Germanicus. See GERMANIA; GERMANICUS CÆSAR.

MARSIAN (mär'sĭ-an) **WAR.** See SOCIAL WAR.

MARSICK, mär'sĭk', MARTIN PIERRE JOSEPH (1848–). A Belgian violinist and teacher, born at Jupille, near Liége. His earliest professional instruction was at the Désire-Heynberg Conservatory at Liége. His musical precocity was such that at 12 years of age he was organist of the Liége Cathedral. At 17 years of age he became a pupil of Léonard at the Brussels Conservatory, and a year later entered the Paris Conservatory, where he studied under Massart and won the first prize for violin playing. He completed his student course under Joachim at Berlin, and in 1873 made a very successful début at the "concerts populaires." He became a member of the faculty of the Paris Conservatory in 1892, succeeding Massart as professor of violin. His compositions are almost entirely for the violin and are very popular on the French concert platform. In 1895–96 he toured the United States and confirmed the reputation that had preceded him.

MARSIGLI, mär-sē'lyē, LUIGI FERDINANDO, COUNT (1658–1730). An Italian soldier and scholar, born at Bologna. He rose from the ranks to be general in the Austrian army. After the fall of Altbreisach (1703), where he was second in command, he was degraded by court-martial and was never entirely reinstated, though generally considered innocent. Thereafter Marsigli devoted himself to scientific explorations and founded the Institute of Science and Arts at Bologna (1714). In connection with it he established a press for printing its reports. His works include: *Osservazione intorno al Bosforo tracio* (1681); *Storia del mare* (1711); *Danubius Pannonico-Mysicus* (1726); *Stato militare dell' imperio ottomano* (1732).

MARSIGLIO, mär-sē'lyō. See MARSILIUS.

MARSIL'EA'CEÆ. One of the two families of water ferns, the other being the Salviniaceæ (q.v.). The family comprises the two genera *Marsilea* and *Pilularia*, whose species root in the mud, either under water or in muddy flats. The stem is prostrate and gives rise to a series of leaves, whose blades reach the surface of the water. The leaf of *Marsilea* has a long petiole bearing four wedge-shaped leaflets, peltately arranged, and resembling a four-leaved clover, except that the veins are forking. The fruit body (sporocarp) of *Marsilea* is somewhat bean-shaped, and is borne on a stalk that arises from the petiole, which represents a branch of the leaf bearing and inclosing the sporangia.

MARSILI, mär-sē'lē, LUIGI (c.1330–94). An Italian humanist. He was born at Florence and there entered the Augustinian convent of Santo Spirito. He studied theology at Paris, on the advice of Petrarch, who wished him to become a Christian champion against the Averroists. Santo Spirito under Marsili became the seat of a society for classical study and discussion; among its members was Coluccio Salutati. Marsili was employed in several diplomatic errands by the city of Florence. His manuscript comments on Petrarch's poems were preserved at the Laurentian Library. Consult Rossi, *Il quattrocento* (Milan).

MARSIL'IUS, or **MARSIGLIO,** mär-sē'lyō, OF PADUA (c.1270–c.1343). A Christian polemic. He was born in Padua and studied medicine there. Later he taught philosophy at Paris and became rector of the university in 1313. There between 1324 and 1326 he produced, in conjunction with John of Jandun, the treatise on jurisprudence which gives him his lasting fame, the *Defensor Pacis*, an arraignment of the "usurpations," as he terms them, of the Roman pontiff. The way to peace, he maintains, is for the spiritual power to give up its claim to rule the temporal power. He argues for a virtual separation of Church and state, and pleads in singularly modern language for religious liberty and the

equality of the clergy. He denies the right of the Church to punish heresy. He accompanied his patron, Louis of Bavaria, in his conquest of Rome (1328), where for a short time his ideas were put into practice. His book was printed and published at Basel (1522). The anonymous editor was probably the printer Valentinus Curius, though some think he was Huldreich Zwingli. It was translated by William Marshall (London, 1553).

MARSIPOBRANCHII, mär'sĭp-ō-brăn'kĭ-ī. A class of fishlike animals, the lampreys, with a cartilaginous skeleton and the skull imperfectly developed. See CYCLOSTOMI.

MARSIVAN, mär'sē-vän'. A town of Asia Minor in the Vilayet of Sivas, situated among gardens and vineyards, 56 miles south of the Black Sea (Map: Turkey in Asia, C 2). It is the seat of Anatolia College, an institution with which a Protestant theological seminary and an American hospital are connected, the three institutions having a student body of over 700. The city also contains Jesuit and Armenian schools. In the neighborhood are a silver mine and hot mineral springs. It is a prosperous town with a population of about 25,000, most of them Moslems.

MARS-LA-TOUR, märs'-lä-tōōr'. A village of France, in the Department of Meurthe-et-Moselle, 12 miles west-southwest of Metz. It is noted for the bloody cavalry battle which took place there between the French and Germans, Aug. 16, 1870, better known as the battle of Vionville (q.v.).

MAR'STON, JOHN (?1575–1634). An English dramatist, belonging to the Marstons of Shropshire. He was born probably at Coventry about 1575. In 1594 he graduated B.A. from Brasenose College, Oxford, and very soon, it would seem, studied law. Turning to literature, he published in 1598 *The Metamorphosis of Pigmalions Image; and Certaine Satyres,* and *The Scourge of Villanie: three Books of Satyres.* The first, *Pigmalions Image,* is an amatory poem, written, the author asserted, to bring into disrepute the whole species. The satires, some of which are devoted to a quarrel between Marston and Joseph Hall, are coarse and brutal. On the other hand, they are not wanting in vigor and point. Most famous are the lines in which Marston dedicates himself to everlasting oblivion. The earliest trace of Marston as a playwright is in Henslowe's Diary (Sept. 28, 1599). His extant tragedies comprise: *Antonio and Mellida* and *Antonio's Revenge* (1602); *The Malcontent* (1604); *Sophonisba* (1606); *The Insatiate Countess* (1613), which, however, is sometimes assigned to William Barksteed. His comedies comprise: *The Dutch Courtezan* (1605); *Parasitaster, or The Fawne* (1606); *What You Will* (1607). As he often collaborated, his hand is also discernible in several other plays. In conjunction with Chapman and Jonson he wrote *Eastward Hoe* (1605); and on account of certain offensive passages he and Chapman were sent to prison, where Jonson voluntarily joined them. Before this Marston and Jonson had quarreled, but they were now reconciled. The comedies are lively and entertaining. The tragedies contain passages of power and beauty, but they tend too much to bombast, coarseness, and the gross horrors of the tragedies of blood. The best is *The Insatiate Countess.* In middle life Marston left the stage and entered the Church. From 1616 to 1631 he held the living of Christchurch in Hampshire. He died in London, June 25, 1634. Marston's *Workes* were first published in London, in 1633. The *Works,* edited by J. O. H. Phillipps, appeared in 1856 (3 vols., London); and, edited by A. H. Bullen, in 1887 (3 vols., ib.). The *Poems,* edited by A. B. Grosart, appeared in 1879 (2 vols., ib.). Consult also: F. G. Fleay, *Biographical Chronicle of the English Drama, 1559–1642* (London, 1891); "John Marston als Dramatiker," in *Englische Studien,* vols. xx, xxi (Heilbronn, 1895); W. M. Dixon, in *Cambridge History of English Literature,* vol. vi (Cambridge, 1910).

MARSTON, JOHN WESTLAND (1819–90). An English dramatic poet, born in Lincolnshire. He studied law, but left that profession for literature. He published *Gerald and Other Poems* (1842), besides some novels and short stories, and was long a contributor to the *Athenæum.* His principal literary activity, however, was in the field of dramatic literature. Among his numerous plays are: *The Patrician's Daughter* (1841), a tragedy; *Strathmore* (1849); *Ann Blake* (1852); *A Hard Struggle* (1858); *Donna Diana* (1863), his best play; *The Favorite of Fortune* (1866); *A Hero of Romance* (1867); *Life for Life* (1869).

MARSTON, PHILIP BOURKE (1850–87). An English poet, born in London. From early childhood he suffered a partial loss of sight which ultimately became complete blindness. Besides vision he lost friends, relatives, and fortune, the whole serving to develop in his verse a vein of unvaried sadness. His sonnets and lyrics are highly esteemed for technical excellence. It is generally believed that he was the subject of Mrs. Craik's *Philip, My King.* He is the subject of an elegy by Swinburne. He published three volumes of poetry: *Song Tide and Other Poems* (1871); *All in All* (1875); *Wind Voices* (1883). There were posthumously published a collection of stories, edited by W. Sharp and called *For a Song's Sake and Other Stories* (1887); and, in verse, *Garden Secrets* (1887) and *A Last Harvest* (1891), both edited by Mrs. Louise C. Moulton. Consult Coulson Kernahan, in *Sorrow and Song* (Philadelphia, 1894), and William Sharp, in *Papers Critical and Reminiscent* (New York, 1912).

MARSTON MOOR. A plain in Yorkshire, England, where, July 2, 1644, the Royalist army, under Prince Rupert, was beaten by the Parliamentary forces, English and Scottish, under Fairfax, the Earl of Manchester, and the Earl of Leven. The approach of Rupert forced Fairfax to abandon the siege of York, and he took up his position on Marston Moor, with about 25,000 men. Rupert, with about the same number, came up with him on the afternoon of July 2; and in the evening, at the head of the Royalist right, he made a fierce charge upon the Parliamentary left, which broke and fled in disorder. The Parliamentary centre had likewise been broken by the infantry of the Royalist centre and had suffered heavily; but while the Royalists were dispersed in search of plunder or in pursuit of the enemy, Cromwell's famous Ironsides brigade, with the Scottish regiments, commanded by David Leslie, and some others, rallied, charged the Royalists vigorously, and remained masters of the field, capturing 1500 prisoners and all the Royalist artillery. The killed on the Royalist side numbered 4000 and the wounded about as many more; on the Parlia-

mentary side the losses numbered only a few hundred. This victory resulted in the occupation of York and the control of the whole North of England by the Parliamentary forces. Consult S. R. Gardiner, *History of the Great Civil War* (London, 1901), and J. W. Kennedy, *The Scottish Borderers at Marston Moor, 1644* (Hawick, Scotland, 1902).

MARSTRAND, mär'strân, VILHELM NIKOLAI (1810–73). A Danish genre painter, born in Copenhagen. Here he studied at the Academy and under Eckersberg, but at an early stage worked independently and won success with such subjects as a "Sleigh Drive by Torchlight" (1829) and a "Musical Party" (1834), of special interest as containing numerous portraits from the musical world. In 1836 he went to Rome, where he joined the circle that centred about Thorvaldsen and where, with others, he painted an "Episode in the October Festival at Rome" (1840, Thorvaldsen Museum, Copenhagen). After visiting Florence he passed a year in Munich and returned home in 1841. Prominent among his productions during the next decade were a "Scene from Danish Peasant Life" (after Holberg) and "Childbed Room" (1846), both in the Copenhagen Gallery, and "Pothouse Politicians" (1852, Hamburg Gallery), besides other episodes and characters from the plays of Holberg. On a trip through Sweden he sketched hundreds of studies, embodied afterward in "A Sunday in Dalecarlia" (1853, Copenhagen Gallery). His keen powers of observation and characterization, his healthy, wholesome satire, and freshness of ideas have assured Marstrand a unique position in Danish art. His versatility was also remarkable and after repeated visits to Italy he painted portraits, religious and historical subjects. His success in the latter field is evidenced by his mural paintings in the mortuary chapel of Christian IV at Roeskilde and "Foundation of Copenhagen University," in the Aula of that building. His illustrations to *Don Quixote* constitute part of his most meritorious work. He was appointed professor at the Copenhagen Academy in 1848 and director in 1853.

MARSTRANDER, mär-strän'dĕr, CARL JOHAN SVERDRUP (1883–). A Norwegian philologist, born at Christiansand. He was educated at the University of Christiania, became a lieutenant in the army, but took up the study of languages—comparative philology and (from 1906) Celtic being his specialties. In 1907 he went with government scholarship to Ireland, in 1908 became stipendiary in comparative philology at the University of Christiania, and in 1910 was appointed professor of Celtic and comparative philology in the School of Irish Learning at Dublin. He published Irish texts and scientific essays in *Zeitschrift für celtische Philologie, Indogermanische Forschungen, Christiania Videnskabs-Selskabs Skrifter,* and especially in *Erin,* of which he became one of the editors. He was also appointed editor of the large *Irish Dictionary* of the Royal Irish Academy, Dublin, and edited, with Osborn Bergin, *Miscellany to Kuno Meyer* (Halle, 1912).

MARS ULTOR, TEMPLE OF. See AUGUSTUS, FORUM OF; MARS, *Roman.*

MARSU'PIAL FROG (from Lat. *marsupium,* from Gk. *μαρσίπιον, marsipion,* dim. of *μάρσιπος, marsipos, μάρσιππος, marsippos, μάρσυπος, marsypos,* pouch). A tree frog of the South American genus *Nototrema,* which is peculiar among the Hylidæ in that the female has a pouch on her back for the reception of the eggs. This pouch forms two blind sacs made by infolding of the skin, which extend forward over the back; but in one species the opening is longitudinal. The eggs are few in number and of large size, with much food yolk, for in most species the embryos remain in the pouch until they are fully matured. How the eggs get into the pouch is not known, but Gadow thinks it most likely that they are placed there by the help of the male immediately after fertilization. Five or six species of these small, brightly colored frogs have been described from the tropical forests of Venezuela and the upper Amazon. Consult Hans Gadow, *Amphibia and Reptiles* (London, 1901).

MAR'SUPIA'LIA. The marsupials form one of the great subdivisions of the class Mammalia, and are of special interest because of their ancestral history and relationships and their remarkable geographical distribution. Although ranked as an order, Marsupialia is coëxtensive with the subclass Metatheria (q.v.). Its principal characters are as follows: the brain is small, with the surface folding absent or very simple, the corpus callosum rudimentary, and the cerebellum completely exposed. Epipubic bones are present in both sexes, and there are other important skeletal characters, prominently a tendency to the separation of bones ankylosed in the higher Eutheria. The mammary glands are provided with long teats, and are usually inclosed in a marsupium or pouch, which serves to protect the helpless young. The imperfection or absence of the pouch is found only among the Koalas, who grow and suckle on the mother's teat after postnatal removal, the young being protected only by the hair of the mother's abdomen. The young when born are very minute and undeveloped. They are not merely imperfect fœtuses, but actual larvæ, inasmuch as they are provided with a special sucking mouth, in adaptation to their needs, which is later replaced by a true mouth. The young when born are transferred by the lips of the mother to the pouch, where they are placed upon a teat to which the temporary sucking mouth clings; and, as they are unable to suck, the milk is injected into them by the action of special muscles of the mammary gland. (See GLAND.) The organs of reproduction are peculiar to the group, which is often called Didelphia in reference to their character. The oviducts never unite to form a uterus and the vagina is always double, at least in part; the testes hang suspended in front of the penis and the glans of the latter is often bifurcate. The anus and urinogenital opening are surrounded by a common sphincter muscle. It was formerly supposed that no allantoic placenta was present in the group, but it is now known to exist in some bandicoots (*Perameles*). The egg is minute, as in Eutheria, but incompletely divides at first.

In dentition and habits as great a variety exists among the marsupials as in all the rest of the mammals together, for carnivorous, herbivorous, insectivorous, and omnivorous forms are all well known, including arboreal, terrestrial, cursorial, leaping, and burrowing forms. In distribution, one family, the Didelphyidæ (opossums), is peculiar to the American continent, where it is spread from New York State to Patagonia; only two of the 23 species, however, occur north of Mexico. Opossums are the most

MARSUPIALS

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1 KANGAROO — MACROPUS GIGANTEUS
2 OPOSSUM — DIDELPHYS VIRGINIANA
3 — KOALA — PHASCOLARCTUS CINEREUS
4 TASMANIAN WOLF — THYLACINUS CYNOCEPHALUS
½ NATURAL SIZE

primitive of all the marsupials and are thought to resemble closely the ancestral stock from which came the living members of this infraclass. All the other marsupials (except one) are confined to the Australasian region, where they completely dominate all other mammals and form the most characteristic feature of the fauna. Their survival and prosperity in Australia are doubtless due to the entire absence there of destructive carnivores, except the dingo, of doubtful antiquity; and they have become diversified within their limited circumstances in the same way as have the larger company of mammals all over the world, to enable them to utilize all possible advantages. The fact of marsupials existing in America, and especially in the Neotropical region, has excited much speculation as to how they came there, so remote from Australia. Geographical researches show that during the Mesozoic age marsupials inhabited Europe and North America, but none of that period have been found in Australian rocks. These oldest ancestors of the race appear to have been mainly of the polyprotodont type, little differentiated from the diprotodonts, however; and either this differentiation occurred very long ago (in Jurassic or Cretaceous times) or the latter is a condition which has arisen, as Beddard suggests, independently in both South America and Australia. At any rate, before the Tertiary age was finished pouched marsupials disappeared from the Northern Hemisphere and survived only in Australasia and South America. The hypothesis of a former land connection between Australia and Patagonia is still a moot question. It seems probable that in early Tertiary times there must have been a land connection by way of the Antarctic continent. The most eminent authorities differ on this point. It is interesting to know that a diprotodont (see OPOSSUM RAT) exists in Patagonia.

The relationships of marsupials have become much better understood than formerly. The name Metatheria was originally given with the idea that this group was intermediate between the Prototheria (monotremes) and higher Eutheria, and in a sense this is true, but the former belief that it represents a stage of development from the Prototheria to the monodelphic mammals is not now accepted. The distinctions between the marsupials and the Monotremata are fundamental, and there is no evidence of the derivation of the two branches from any common source. On the contrary, as Beddard concludes in a learned review of the subject, the great specialization of the structure of the marsupials (including evidence of degeneration), and their age, point to the fact that they are the descendants of an early form of eutherian mammal, since the time when the stock had acquired diphydonty and the allantoic placenta. See the article MAMMALIA.

Classification. Rather less than 150 species are known, but they exhibit a most extraordinary variety of size, form, and color. The classification of the marsupials is based primarily upon the dentition, although the characters of the feet have been given much weight recently. There are two principal groups, the *Polyprotodontia*, which have numerous small, subequal incisor teeth, and the *Diprotodontia*, which have not more than six incisors in each jaw and usually have only two in the lower jaw. The former includes the opossums, Tasmanian wolf and "devil," the dasyures, bandicoots, and the like; while in the latter are the wombats, phalangers, koala, and kangaroos. Descriptive articles will be found under each of these terms and the related words.

Bibliography. In addition to standard works and books descriptive of Australia consult the folio volumes with colored plates by John Gould, *Monograph of the Macropodidæ* (London, 1841); C. R. Waterhouse, "Marsupialia or Pouched Animals," in William Jardine, *Naturalists' Library*, vol. xxiv (Edinburgh, 1855); John Gould, *Mammals of Australia* (3 vols., London, 1863); Gerard Krefft, *Mammals of Australia* (Sydney, 1871); Oldfield Thomas, *Catalogue of Marsupialia and Monotremata in the British Museum* (London, 1888); F. E. Beddard, *Mammalia* (ib., 1902); W. K. Gregory, "Orders of Mammals," in *American Museum of Natural History, Bulletin*, vol. xxvii (New York, 1910); Parker and Haswell, *Text-Book of Zoölogy* (ib., 1910); W. B. Scott, *History of Land Mammals in the Western Hemisphere* (ib., 1913).

MARSU'PIAL MOLE (*Notoryctes typhlops*). A small burrowing marsupial of central southern Australia. The marsupial mole is in no way connected with the European mole, but nevertheless has acquired many similar habits, affording a valuable lesson in parallelism in development. Consult Beddard, *Mammalia* (London and New York, 1902).

MARSUPPINI, mär'sōōp-pē'nē, CARLO. See ARETINO, CARLO.

MAR'SUS, DOMITIUS (c.54 B.C.–c.4 B.C.). A Roman poet of the Augustan age. He seems to have been a friend of Mæcenas (Martial, viii, 56, 21), and of Vergil and Tibullus, but he is not mentioned by Horace. His works include: *Cicuta*, Hemlock, a collection of epigrams: *De Urbanitate*, a treatise, bitterly satirical, on the use of wit, in oratory, which is quoted by Quintilian; *Amazonis*, an epic; and erotic elegies and fables. He is frequently mentioned by Martial (iv, 29, 7; vii, 29, 7), who praises the wit and severity of his satire. The few fragments of his works may be found in Bährens, *Fragmenta Poetarum Romanorum* (1886). Consult: J. A. Weichert, *Poetarum Latinorum Vitæ et Reliquiæ* (1830); R. Unger, *De Domitii Marsi Cicuta* (Friedland, 1861); W. S. Teuffel, *Geschichte der römischen Litteratur*, vol. ii (6th ed., Leipzig, 1910); M. Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (3d ed., Munich, 1911).

MAR'SYAS (Lat., from Gk. Μαρσύας). One of the Sileni of Asia Minor, and therefore at once a spirit of the water (perhaps originally god of the river Marsyas: see below) and of music, especially of the flute, which was associated with the worship of the great goddess Cybele (q.v.), as whose devoted servant Marsyas appears in the Phrygian legend. Thus he is called the son of Hyagnis (to whom was attributed sometimes the invention of the flute), and a teacher of Olympus, to whom the development of the art was assigned. Under Greek and especially Attic influence other features were added to the legend. Athena, so ran the story, had invented the flute, but, observing the reflection of her distorted face as she played on the flute, threw it from her. It was found by the Silenus, or satyr, Marsyas, who became so skillful in its use that he ventured to challenge the god of the cithara, Apollo, to a musical contest. Here two versions follow. According to one, King Midas as judge gave the decision to Marsyas, whereupon Apollo bestowed on the

umpire asses' ears for his poor judgment. In the other version the muses were the arbiters, and gave the decision to Apollo, as his instrument allowed him to add song. In both versions the god hung his presumptuous rival to a tree and flayed him alive, or caused him to be flayed by a Scythian slave. At Celænæ in Phrygia Marsyas was worshiped at the cavern whence flows the tributary of the Mæander that bears his name, and here also was shown his skin, which had been hung up in warning by the victorious god. In the Forum at Rome and in Roman colonies statues of Marsyas were set up as a symbol of liberty. Marsyas was a favorite figure in art. The Athenian sculptor Myron made a famous group of Athena and Marsyas, of which the latter figure seems reproduced in a marble statue in the Lateran, which represents Marsyas as picking up the flute. Another celebrated group is represented by the statue of Marsyas hung from the tree, and the celebrated Florentine figure of the Scythian whetting his knife to flay Marsyas (found at Rome in the 16th century); of the other figures of this group no certain copies have been identified. The competition was also represented on the base of the statues of Leto, Apollo, and Artemis at Mantinea, by Praxiteles, and of this composition three of the four slabs are now in the Museum at Athens.

MART. A city in McLennan Co., Tex., 19 miles by rail east of Waco, on the International and Great Northern Railroad (Map: Texas, D 4). It is in a productive cotton region, and has large cotton gins, oil mills, and compresses. The city contains also a fine high-school building and railroad repair shops. The water works are owned by the municipality. Mart has adopted the commission form of government. Pop., 1910, 2939.

MARTEAU, mär'tō', Henri (1874–). A French violinist, born at Rheims. He studied with Léonard and, after the latter's death in 1891, entered the Paris Conservatory, where in the following year he won the first prize. From 1892 to 1894 he toured the United States with emphatic success. His tours of Scandinavia from 1894 to 1899 were equally successful. In 1900 he was appointed professor in the conservatory at Geneva, and in 1908 he succeeded Joachim at the Königliche Hochschule in Berlin. He published some meritorious chamber music and a scena for soprano, chorus, and orchestra.

MARTEL, Charles. See Charles Martel.

MARTEL, mär'tĕl', Louis Joseph (1813–92). A French politician, born at Saint-Omer. He studied law, entered politics, and was elected to the Legislative Assembly of 1849 from Pas-de-Calais. He protested strongly against the coup d'état of 1851. He was a member of the Corps Législatif from 1863 to 1870; in 1871 was elected to the National Assembly, and was vice president of the Chamber. In 1875 he was elected life member of the Senate; in 1876 he became vice president of the Senate, and in 1876–77 he was Minister of Justice and Public Instruction. In 1879–80 he was again president of the Senate.

MARTEL DE JANVILLE, de zhän'vĕl', Gabrielle, Countess de (1850–). A French author, born at the château of Coëtsal (Morbihan), and better known by her pen name, Gyp. She was the great-grandniece of Mirabeau, and married Count Martel de Janville in 1869. She created the essentially Parisian characters Petit Bob, Loulou, and Paulette, types of a more or less risqué society, which she describes in witty dialogue, and with piquant satire. Her very numerous novels (133 in 31 years) include: *Petit Bob* (1882); *Autour du mariage* (1883); *Un homme délicat* (1884); *Elle et lui* (1885); *Autour du divorce* (1886); *Pour ne pas l'être?* (1887); *Pauvres petit' femmes* (1888); *Bob au salon* (1888); *Mademoiselle Eve* (1889); *Bob à l'exposition* (1889); *L'Education d'un prince* (1890); *Monsieur Fred* (1891); *Mariage civil* (1892); *Du haut en bas* (1893); *Mariage de chiffon* (1894); *Le cœur d'Ariane* (1895); *Le bonheur de Ginette* (1896); *Totote* (1897); *Israël* (1898); *L'Entrevue* (1899); *Le pays des champs* (1900); *Le friquet* (1901); *Sœurette* (1902; 2d ed., 1910); *Un ménage dernier cri* (1903); *Maman* (1904; 2d ed., 1910); *Le cœur de Pierrette* (1905); *Ces bons Normands* (1907); *La paix des champs* (1908); *Joies d'amour* (1909); *L'Amoureux de Line* (1910); *La guinguette* (1911); *Le grand coup* (1912); *Napoléonnette* (21st ed., 1913).

MARTELÉ, mär'te-lā' (Fr., hammered). In music, a direction for bow instruments, indicating that notes so marked are to be played with a clean, decided stroke. When the term is used in piano music it means that the keys are to be struck heavily and firmly.

MARTEL'LO TOWER. A round masonry tower designed to form part of a system of coast defense. The original Martello tower was situated in the Gulf of San Fiorenzo, Corsica, and was named after its inventor. In 1794 two British war ships unsuccessfully attacked it, with loss to themselves; this single experience, it is said, leading afterward to the adoption of Martello towers by the English. They were erected along the more exposed parts of the south coast and the south and southeastern coasts of Ireland. They were determined on and built hurriedly during the Napoleonic wars, owing to fear of a French invasion. They are about 40 feet high, solidly built, and situated on or near the beach. The walls are five and one-half feet thick and were supposed to be bomb-proof; the base formed the magazine, the garrison occupied the two upper rooms, and the swivel heavy gun and its accompanying howitzers were placed on the roof. They were a great expense to the nation, and have always been regarded as worthless. They are now dismantled and, except in the few instances where they are utilized by the coast guard, abandoned.

MAR'TEN (Fr. *martre, marte,* from ML. *martus, marturis, mardarus, mardalus, mardarius,* from OHG. *mardar,* Ger. *Marder,* from OHG. *mart,* AS. *mearþ,* marten; probably connected with Lith. *martis,* bride). Either of two species of fur-bearing animals of the genus *Mustela,* which also contains the sables. The body is elongated and supple, as in weasels, the legs short, and the toes separate, with sharp, long claws. The nose is grooved and the ears are shorter and broader than in weasels, and the tail is bushy. The martens exhibit great agility and gracefulness in their movements and are very expert in climbing trees, among which they generally live, furnishing a lofty hollow in a decaying trunk with a bed of leaves. Here the young are brought forth in litters of six to eight early each spring; but in a mountainous country all will make dens, sometimes in crevices of rocks.

The term marten is somewhat indefinite, but is most applied in America to the animal which is the nearest analogue to the Old World sable

(q.v.), and hence is frequently called the American sable or pine marten: technically it is *Mustela americana*. This species, which for 250 years has supplied the most valuable of the American furs gathered from its tribe, originally had a range wherever forests grew from New Jersey and Pennsylvania to Labrador and Hudson Bay, and from Colorado and central California to the barren grounds of the Arctic coast; and it was so plentiful that periodically it overflowed certain districts and spread in hordes, scattering far and wide in search of food. On the other hand, periods of astonishing scarcity of martens occur every eight or ten years, no cause for which is known. The incessant trapping which goes on in the wilderness has of course considerable effect in diminishing their numbers, and this species everywhere disappears before the approach of civilization. They keep mostly to the trees, and hence like the denser parts of the forest, but they constantly descend to the ground for food, especially in winter, when they regularly hunt for hares and grouse of all kinds, trailing them with nose to the track like hounds. Their broad feet enable them to move rapidly, even over soft snow. They also hunt persistently for squirrels, chase them in the trees and on the ground, and enter their nests. To this diet are added whatever mice and birds and small fare come their way.

Martens have little to fear from native foes; the much larger fisher is said to kill them occasionally, and it is not improbable that the great horned owl now and then manages to pounce on one, but very few of the carnivores care to taste their flesh unless driven to it by extreme hunger. They are trapped from November until towards March, when their coat begins to become ragged and dull in hue, and with the approach of the rutting season they are no longer attracted by the baits offered by trappers. This species averages about 18 inches in length of head and body, plus seven to eight inches of tail. Its highly variable tints may be described as rich brown, somewhat lighter below. The winter fur is full and soft, an inch and a half deep, and has sparsely scattered through it coarse black hairs which the furrier pulls out. The tail has longer hairs, but is less bushy than that of the fisher. The distinction between this animal and either the European pine marten or the Asiatic sable is visible only to an experienced eye, and it is only recently that naturalists have agreed to regard them as specifically distinct. Four closely related species are recognized in North America, while the best known (*americana*) is divided into six subspecies.

A much larger, very distinct American form, unlike anything in the Old World, is Pennant's marten (*Mustela rennanti*), the "pekan" of French-Canadian trappers and commonly known to Americans as the "black cat" or "fisher," the latter an erroneous name, since the animal never catches fish. It is the largest of its race, and is described under FISHER. For illustration of the pine marten see Plate of FUR-BEARING ANIMALS. Three other species are natives of western Europe, including the now rare and restricted pine or sweet marten (*Mustela* or *Martes martes*) and the more common beech or stone marten (*Mustela* or *Martes foina*), which is not an inhabitant of Great Britain. The habits of both are substantially the same as have been described above, and they differ mainly in the pine marten having (like the American form) a yellowish throat and chest, while that of the beech marten is white. Consult: Elliott Coues, *Fur-Bearing Animals* (Washington, 1877); Sir H. H. Johnston, *British Mammals* (London, 1903); E. T. Seton, *Life-Histories of Northern Animals* (New York, 1909).

MARTEN, HENRY (1602–80). An English regicide. He studied at University College, Oxford, and in 1640 became a member of Parliament. There he joined the extremists of the popular party, and as early as 1643 urged the extirpation of the entire royal family. For this he was expelled from the House. In 1646 permitted to return to Parliament, he again urged extreme action against the King. He was at odds with Cromwell for a time, but later cooperated with him in bringing about the King's trial, at which he was one of the leading judges. He was especially active in establishing the Republic, and he continued to have great influence in Parliament during the Protectorate. Upon the Restoration he gave himself up as a regicide in 1660, was tried and found guilty, but was not executed. He died in prison.

MARTÈNE, mär'tân', EDMOND (1654–1739). A Roman Catholic scholar. He was born at Saint-Jean-de-Lôsne, near Dijon; became a Benedictine monk at 18, and joined the famous Congregation of St. Maur. He spent his life in the service of learning, searching the libraries of Germany, France, and the Netherlands, the fruits of the search appearing in many works, notably in the new edition of the *Gallia Christiana* (14 vols., 1715–56); *Commentarius in Regulam Sancti Patris Benedicti* (1690); *Thesaurus Novus Anecdotorum* (1717); *Veterum Scriptorum et Monumentorum Historicorum Dogmaticorum et Moralium Amplissima Collectio* (1724–33); *Annales Ordinis S. Benedicti*, vol. vi (Paris, 1739).

MARTENS, mär'tĕns, FEDOR FEDOROVITCH, or FRIEDRICH FROMMHOLD VON (1845–1909). A Russian writer on international law, born at Pernau in Livonia. He studied law at the universities of St. Petersburg, Vienna, Heidelberg, and Leipzig. In 1868 he became an official of the Ministry for Foreign Affairs and thereafter continued to be an active and influential figure in matters of foreign diplomacy. In 1873 he was appointed professor of public law at the university of St. Petersburg. He took part in the Brussels conference for the codification of martial law (1874). In 1884 and 1887 he was a member of the Red Cross conferences. In 1889 he represented Russia at the Brussels conference for commerce and maritime law. He was intrusted with the office of arbitrator between England and France in the New Zealand question in 1891, and two years afterward he was a delegate to The Hague conference on arbitration. He was chosen vice president of the Institute of International Law at The Hague in 1894. In 1905 he was legal adviser to the Russian peace plenipotentiaries at Portsmouth. His publications include: *Recueil de traités et conventions conclus par la Russie avec les puissances étrangères* (1874–1909); *Das Consularwesen im Orient* (Ger. trans., 1874); *La Russie et l'Angleterre dans l'Asie Centrale* (1879); *La question égyptienne* (1881); *La conférence africaine de Berlin* (1885); *La paix et la guerre* (Fr. trans., 1901); and his famous treatise on international law (1882), which is available in French and German translations.

MARTENS, GEORG FRIEDRICH VON (1756–

1821). A German publicist and diplomat, born at Hamburg. He studied at the universities of Göttingen, Strassburg, and Vienna. From 1783 to 1789 he was professor of law at Göttingen. In the latter year he was ennobled. In 1808 he entered into the Westphalian civil service as Councilor of State and after 1810 as head of the finance department. After the restoration, he was made Privy Councilor by the King of Hanover. Martens's chief literary work is *Recueil de traités* (7 vols., 1791–1801; 4 suppl. vols., 1802–08); *Nouveau recueil* (1817–42; continued by Karl von Martens and others); but he acquired special fame by his *Précis du droit des gens modernes de l'Europe* (1789; 3d ed., 1821; rev. by Pucheiro-Ferreira, 1864).

MAR'TENSEN, HANS LASSEN (1808–84). A Danish theologian and bishop. He was born at Flensburg, Schleswig, Aug. 19, 1808; studied theology at the University of Copenhagen; and in 1840 became professor at the university, first in philosophy and afterward in theology. In 1845 he was appointed preacher to the Danish court, and in 1854 elevated to the bishopric of Seeland, the highest dignity of the Danish church. In this position, by his eminent scholarship, his catholic spirit, and his tireless activity, he exerted a powerful and beneficent influence. His writings show a modified mysticism, the result of his study of the mediæval mystics. He died in Copenhagen, Feb. 3, 1884. His works include: *Mester Eckart* (1840), an essay on the mysticism of the Middle Ages; an *Outline of a System of Ethics* (1841); *Christian Dogmatics* (1849; 5th ed., 1904; Ger., French, Swed. trans.; Eng. trans., 1866); a *System of Christian Ethics* (1871–78; Ger., Swed. trans.; Eng. trans., 1873–82), his main work; *Katolicisme og Protestantisme* (1874); *Jakob Böhme* (1882; Eng. trans., 1885); an autobiography (Ger. trans., *Aus meinem Leben*, 1883–84). Consult also his correspondence with Dorner, *Briefwechsel mit L. A. Dorner* (2 vols., Berlin, 1888).

MARTENSITE. See IRON; METALLOGRAPHY.

MAR'THA, *Ger. pron.* mär'tȧ. An opera by Flotow (q.v.), first produced in Vienna, Nov. 25, 1847; in the United States, Nov. 1, 1852 (New York).

MAR'THA AND MA'RY, OF BETHANY. Two sisters named in the Gosepls of Luke and John as special friends of Jesus. At their home in Bethany, on the Mount of Olives, near Jerusalem, Jesus found a welcome on his visits to Jerusalem. Martha, being represented as taking the lead, was perhaps the elder, though Mary was the more appreciative of Jesus' teaching (cf. Luke x. 38–42). The regard in which Jesus held the sisters was extended to their brother Lazarus (q.v.), at whose death Jesus came to Bethany to comfort the sisters, not only by the raising of the dead one, but by teaching concerning immortal life, which Martha, however, found hard to grasp (John xi.). A few days before the crucifixion Jesus was a guest at a meal in the home of Simon of Bethany, a leper, at which Martha assisted, and which Mary made the occasion of anointing Jesus with the contents of a box of most precious ointment—a symbol of her regard graciously accepted by Jesus (Matt. xxvi. 6–13; Mark xiv. 3–9; John xii. 1–8). The attempts to identify this anointing with that referred to in Luke vii. 36–50 cannot be pronounced successful. Nothing more is known of the sisters. Mediæval legend confounded Mary with Mary Magdalene (q.v.), and asserted that she, Martha, and Lazarus labored and died in southern France.

MARTHAS VINEYARD. An island lying off the southern coast of Massachusetts, of which State it forms, with one or two minor islets, the County of Dukes (Map: Massachusetts, F 7). It is about 20 miles long and about 9½ miles in greatest width, and is separated from the mainland by Vineyard Sound, 4 to 6 miles wide. The island is mainly level excepting a ridge of hills along the northwestern coast, and some hilly country in the western part. The highest point is Prospect Peak, 308 feet, in Chilmark township. The south coast has shallow lagoons and sand bars, while on the north side the coast consists of bluffs about 30 feet high. Gay Head Light, at the western extremity, is 145 feet above the sea. The island is a much-frequented summer resort, and is noted for its large annual camp meetings which were begun in 1835 at Oak Bluffs, renamed Cottage City in 1907. The principal town and the county seat is Edgartown. The population in 1900 was 4561; in 1910, 4504. The island was discovered and named by Bartholomew Gosnold in 1602. Its Indian inhabitants were all converted to Christianity, and were loyal to the whites during King Philip's War. During the Revolution the island was plundered by the British.

MARTÍ, mär-tē', JOSÉ JULIÁN (1853–95). A Cuban patriot and author, born in Havana. At 16 he was condemned to imprisonment for his liberal ideas and in 1871 was banished to Spain, where he published his first pamphlet, entitled *El Presidio político en Cuba* (1871). He studied in the University of Saragossa and received degrees in law, and philosophy and letters (1873). Escaping from Spain, he went to Mexico (1873), where he edited the *Revista Universal*. In 1877 he went to Guatemala and there wrote plays, taught in the Normal School, and served as judge. After the Peace of Zanjon (1878), he returned to Cuba, but being implicated in the revolutionary movements of 1879, he was deported again to Spain. In 1880 he went to New York, visited Carácas, and returned to New York, where he accepted the position of Consul of Argentina. At this time he began the propaganda in favor of the separation of Cuba from Spain, which won him the title of the "Apostle of the Independence." A prolific writer and an able orator, he devoted his energies to arousing the Cuban émigrés to action. He visited Tampa and Key West in 1891 and the following year founded the *Partido Revolucionario Cubano*, which soon had branches in the Cuban colonies in the cities of the United States, Mexico, Santo Domingo, and Haiti. Martí was named *Delegado* of the Partido with extensive powers. He secured the adhesion of Máximo Gómez to the movement, and carried on the agitation, visiting many cities and making speeches in English and Spanish. Pursuant to his plans, the Cubans arose in revolt on Feb. 24, 1895, and on April 10 Martí and Máximo Gómez landed at Sabana la Mar, near Baracoa, to join the movement. Martí was named, at once, major general of the patriot forces. On May 19 the Cuban army was surprised at Dos Ríos by a Spanish column, and in the skirmish Martí was killed. He published in New York *La Patria*, a journal devoted to Cuban interests, and *La Edad de Oro*, a children's paper. He wrote a novel *Ismaelillo* and numerous poems, translated

Ramona, by Helen Hunt Jackson, and *Mystery,* by Hugh Conway, and corresponded for various newspapers. His writings have been collected and edited by his friend Gonzalo de Quesada, under the title *Obras literarias* (Washington, Havana, and Berlin, 1900–11). Consult: "José Martí: apuntes biográficos," in *Biblioteca del periódico Cuba* (Tampa, Fla., 1896); M. Deulofeu, *Martí, Cayo Hueso, y Tampa* (Cienfuegos, 1905); M. H. Ureña, "José Martí," in *Cuba Contemporánea,* vol. ii (Havana, 1913).

MARTI, mär'tē, KARL (1855–). A Swiss Old Testament scholar, born in Bubendorf, Basel. He studied at Basel under Kautzsch and Socin, at Göttingen under Ritschl, and at Leipzig under Fleischer and Delitzsch. From 1878 to 1895 he was pastor of Reformed churches in the Canton of Basel, and for most of this time taught in the University of Basel. He went to the University of Bern in 1895 as professor of Old Testament, and after 1901 also held the chair of Semitic philology. In 1912 he was rector of the university. His most important work was on the prophets, and his published works include: *Der Prophet Jeremia von Anatot* (1889); *Der Prophet Sacharja, etc.* (1892); *Der Einfluss der Ergebnisse der neuesten alt-testamentlichen Forschungen auf Religionsgeschichte und Glaubenslehre* (1894; also in a Swedish version); *Kurzgefasste Grammatik der biblisch-aramäischen Sprache* (1896; 2d ed., 1911); *Geschichte der israelitischen Religion* (1897; 5th ed., 1904); "Isaiah" (1900), "Daniel" (1901), and the "Dodekapropheton" (1903–04) in the *Kurzer Hand-Kommentar zum alten Testament,* of which he was editor from 1897 to 1904; *The Religion of the Old Testament* (1907; in German, 1906); *Stand und Aufgabe der alttestamentlichen Wissenschaft in den Gegenwart* (1912).

MARTIAL, mär'shal (MARCUS VALERIUS MARTIALIS). The greatest Roman epigrammatist. He was born at Bilbilis, in Spain, March 1, 38–41 A.D.; the exact year is in doubt. In 64 he came to Rome, where he resided till 98, when he returned to his native town. Here he found many good friends and patrons, and a highly cultivated lady named Marcella made him a present of a small estate, where he passed in repose the years until his death, which occurred not later than 104 A.D.. While at Rome Martial became famous as a wit and poet, and received the patronage of the emperors Titus and Domitian. He was on intimate terms with Juvenal (q.v.). He lived in a sort of precarious affluence in a mansion in the city, and in Nomentum, a suburban villa, to both of which he makes frequent reference. From Rome his reputation rapidly extended to the provinces; and even in Britain his *Epigrammata,* which, divided into 14 books, now form his extant works, were familiarly read. These books, which were arranged by himself for publication, were written in the following order: The first 11, including the *Liber de Spectaculis,* were composed at Rome, with the exception of the third, which was written during a tour in Gallia Togata (Cisalpine Gaul); the twelfth was written at Bilbilis, and the thirteenth and fourteenth at Rome, under Domitian. The last two, entitled *Xenia* and *Apophoreta,* describe in distichs the various kinds of souvenirs presented by the Romans to one another on holidays. To the other books we are also indebted for much of our knowledge of the manners and customs which prevailed under the Empire from Nero to Trajan. Martial's works have also a great literary value, as embodying the best specimens of what we now understand by epigram (q.v.)—not a mere inscription, but a poem of two or more lines, containing the terms of an antithesis, which ends with a witty or ingenious turn of thought. The wonderful inventiveness and facility displayed by Martial in this species of composition have always received the highest admiration, qualified, however, by disgust caused by his grossness, and his servile flattery of Domitian. The best edition of Martial is that of Friedländer (2 vols., Leipzig, 1886); a handy text edition is that of Gilbert (Leipzig, 1886). The "Introduction" to E. Post's excellent edition of *Selected Epigrams of Martial* gives a good account of Martial's life and writings, of his character as a man, of his relations with his contemporaries, of his indebtedness to other writers, especially Catullus (q.v.), and of his fame. He has never found an adequate translator, but a collection of translations in prose and verse will be found in Bohn's "Classical Library." Consult also W. S. Teuffel, *Geschichte der römischen Literatur,* vol. ii (6th ed., Leipzig, 1910); P. Nixon, *A Roman Wit: Epigrams of Martial Rendered into English* (Boston, 1911); and Martin Scanz, *Geschichte der römischen Litteratur,* vol. iii, pt. 2, §§ 413–415a (3d ed., Munich, 1913).

MARTIAL LAW (Lat. *martialis,* pertaining to war or Mars, from *Mars,* the god of war). The exercise of exceptional governing power by military authorities in cases where the ordinary law is superseded by the control of military forces. It is not a written law, but arises out of a necessity, either (*a*) in case of the invasion of a foreign country by belligerents, or (*b*) where by the force of internal dissension or conflict the regular civil authority of a country is partly or wholly overcome, and the proclamation of martial law is necessitated by the exigency of the occasion.

Martial law includes under its sway all persons—whether civil or military. In its administration the forms of military law are adhered to as far as practicable. In the Civil War the government of the United States declared martial law to be the immediate and direct effect and consequence of occupation or conquest, and that it was simply military authority exercised in accordance with the laws and usages of war. When a place, district, or country is occupied by an enemy, civil and criminal law continues to take its usual course unless stopped by order of the occupying military power; but the functions of the hostile government, legislative, executive, or administrative, cease, or continue only with the sanction or participation of the occupier. Under martial law cases which come within the "rules and articles of war," or the jurisdiction conferred by statute on courts-martial, are tried by the latter, otherwise by military commission. It was the judgment of the Supreme Court of the United States *ex parte Milligan* (4 Wall. 2, 127) that, when the civil courts are open and in "the unobstructed exercise of their jurisdiction," a military tribunal is without the necessary jurisdiction to try civilians. Martial law is not retrospective. An offender cannot be tried for an offense committed before martial law is proclaimed. Martial law may continue in a conquered country until a civil government can be established or restored. Acts done under martial law have no immediate con-

stitutional or legislative authorization, but emanate directly from the military power. But where the civil authority exists the Constitution is imperative (Art. VI, Sec. 2) that it shall be paramount. Under the constitutional system of the United States, it is held by the Supreme Court that a State Legislature may proclaim the existence of martial law when demanded by the public safety. The power of the Federal government to make such proclamation is a restricted one, implied from the clause in the Constitution (Art. I, Sec. 9, Sub. 2), providing that only in cases of rebellion or invasion, where necessary for the general welfare, shall the writ of *habeas corpus* be superseded. For further information as to the suspension of the privilege of *habeas corpus* in time of martial law, see HABEAS CORPUS. Compare MILITARY LAW, from which martial law must be distinguished.

MAR'TIA'NUS CAPEL'LA. See CAPELLA, MARTIANUS MINNEUS FELIX.

MARTIGNAC, mär'tē'nyàk', JEAN BAPTISTE SYLVÈRE GAY, VISCOUNT DE (1778–1832). A French politician and administrator, born at Bordeaux. His devotion to the Bourbons and his services to the Duchess d'Angoulême during the Hundred Days won him the post of Procurator-General of Limoges in 1815. Six years later he was elected a deputy, and made himself prominent by his eloquence and his gradual abandonment of his extreme Bourbon sentiments. He accompanied the expedition to Spain in 1823 and two years later was made Viscount. In 1828 he became Secretary of the Interior and actual head of the ministry. Here his policy was checked by a combination of the Right and the Left. He retired in August, 1829, and signed the address of the Two Hundred and Twenty-One; but after the revolution of July, 1830, boldly defended Charles X. He wrote an *Essai historique sur la révolution d'Espagne et sur l'intervention de 1823* (1832). Consult E. Daudet, *Le ministère de M. de Martignac* (Paris, 1875).

MARTIGNY, mär'tē'nyē', or **MARTINACH** (Lat. *Octodurum*). Three united villages in the Canton of Valais, Switzerland, situated 1550 feet above the sea on the left slope of the Rhone valley, about 24 miles south from the east end of Lake Geneva (Map: Switzerland, B 2). The two noted routes, one to the Vale of Chamonix by the Tête Noire or the Col de Balme, and another to the Great St. Bernard, branch off here. Martigny is on the Simplon road into Italy, and is a resort frequented by tourists. Pop., 1900, 4292; 1910, 5613.

MAR'TIN (from *Martin*, Fr. *Martin*, from ML. *Martinus*, Martin, from Lat. *Mars*, the god of war). A swallow; in the United States, one of the large purple swallows of the genus *Progne*. Several of the South American species are familiar birds in Argentina, one species (*Progne tapera*) breeding only in the clay structures of an ovenbird. The common purple martin (*Progne subis*) is widely distributed in North America, ranging in summer as far north as Newfoundland and the Saskatchewan, and wintering in Central and South America. The martin is eight inches long and sixteen across the wings. The male is shining blue-black, while the female is bluish-black above and brownish-gray beneath. The nest was primitively made in hollows of old trees, but in all settled parts of the country the birds now occupy bird houses set upon poles for their accommodation, and they have distributed themselves accordingly, not frequenting farms or villages where bird houses are not erected for them. In occupying these houses they must withstand the competition of bluebirds, wrens, white-bellied swallows, and, most of all, English sparrows. The growing scarcity of the bird in New England is attributed mainly to the usurpations of the last-named species, which, having got possession of the quarters, cannot easily be dislodged. These various influences make the distribution of the species more and more local, and are lessening its numbers in the northeastern States. In the South they are more numerous and familiar, and they are everywhere regarded with affection. The eggs are pure white. The food and habits of the martin are like those of other swallows. See SWALLOW.

In Europe the black swift is sometimes called "black martin," and in France the name "martin" is applied to the kingfisher; but the French colonists in the Orient call the mynas of the genus *Acridotheres* "martins." In the United States the bank swallow (q.v.) is sometimes called "sand martin," and the kingbird is occasionally called "bee martin." Such uses of the word, however, are confusing, and it is desirable that the name martin should be confined at least to the swallows, and in America to those of the genus *Progne*. See Plate of SWALLOWS.

MARTIN. The name of five popes, the second and third of whom are more properly known as Marinus I and II, though since the thirteenth century the two names have commonly been confounded in the lists. MARTIN I, Saint, Pope 649–655. He was a martyr to his firm stand against monothelitism, which he caused to be condemned in the first Lateran Council. (See LATERAN COUNCILS.) In consequence he was seized by the Greek Emperor Constans II, who attempted to depose him and carried him off to the Crimea, where he died a prisoner. Consult *Cambridge Mediæval History*, vol. ii (Cambridge, 1913).—MARTIN II, Pope 882–884. Before his election to fill the vacancy caused by the violent death of John VIII, he had been Bishop of Cære, and chosen by three popes to represent them as legate in the delicate negotiations with the East, in which capacity he was present at the fourth Council of Constantinople in 869. As Pope he had close relations with the English King Alfred, to whom he sent a relic of the cross. Consult H. K. Mann, *Lives of the Popes*, vol. iii (London, 1906).—MARTIN III, Pope 942–946. A Roman by birth and a man of high repute for learning and piety, though his pontificate fell in the unhappy period of the domination of the Italian noble factions. Consult H. K. Mann, *Lives of the Popes*, vol. iv (London, 1910).—MARTIN IV, Pope 1281–85, Simon de Brion. A Frenchman by birth, he became canon of Tours, was made Cardinal by Urban IV in 1261, and was several times legate in France. He was elected Pope by the influence of the French party in the Sacred College, aided by the presence at Viterbo (where the conclave was held) of Charles of Anjou, whom he afterward constantly supported, especially in his efforts to retain possession of Sicily. Consult "Les Régistres de Martin IV," in *Bibliothèque des écoles français d'Athènes et la Rome* (Paris, 1901).—MARTIN V, Pope 1417–31, Otto Colonna. He was born in Rome in 1368. He was named Cardinal in 1405 by Innocent VII, and in 1410 appointed to adjudicate the appeal of Huss, against whom he decided. By his election to

the papacy at Constance the great schism (see CONSTANCE, COUNCIL OF; SCHISM, WESTERN) was finally extinguished. He presided in all the subsequent sessions of the council; and when the Fathers separated without discussing urgent questions of reform, he was finally persuaded to call another council, originally at Pavia, then, from fear of the plague, at Siena, and when it was about to meet at Basel, he designated the zealous reformer Cardinal Cesarini as its president. Martin himself, however, died just before the assembling of the council. Consult Mandell Creighton, *History of the Papacy*, vols. i, ii (London, 1902–04), and Ludwig Pastor, *History of the Popes*, vol. i (ib., 1906).

MARTIN, mär'tăn', BIENVENU (1847–). A French Socialist leader and cabinet officer. He was born at Saint-Bris (Yonne), and was educated in the law. He held an underprefecture, entered the Council of State, and in 1894 became director under the Minister of Colonies. He was an unsuccessful senatorial candidate for Yonne in 1897; was elected deputy for Auxerre in that year; was reëlected in 1898 and 1902; and in 1905 became Senator for Yonne. In the Chamber he supported the Waldeck-Rousseau and the Combes ministries, and advocated the separation of church and state. In 1904 he organized the new Radical Socialist group of the Left. In 1905–06 he held the portfolio of Public Instruction in the Rouvier cabinet; he was Minister of Justice in the Doumergue cabinet in 1913–14, and in the first Viviani cabinet organized in June, 1914; and when the War in Europe (q.v.) broke out in 1914, he became Minister of Labor in the second Viviani cabinet, formed August 26 of that year.

MARTIN, BRADLEY (1841–1913). An American banker, brother of Frederick Townsend Martin, born at Albany, N. Y. He was educated at Union University (A.M., 1863); served as lieutenant in the National Guard during the Civil War; and was admitted to the bar. He devoted his time to the management of his interests in banks, trust companies, and industrial corporations; but he took also a leading part in the social life of New York City. From 1893 until his death he lived in England and Scotland.

MARTIN, mär'tēn, EDUARD (1809–75). A German gynæcologist and obstetrician. He was born at Heidelberg; studied medicine there, at Jena, Göttingen, and Berlin; and became professor of gynæcology at Jena (1837) and at Berlin (1858). Martin was one of the first to operate on diseased ovaries. He wrote: *Lehrbuch der Geburtshilfe für Hebammen* (4th ed., 1880); *Handatlas der Gynäkologie und Geburtshilfe* (1862; 2d ed., 1878); and *Die Neigungen und Beugungen der Gebärmutter* (1866; 2d ed., 1870).

MARTIN, EDWARD SANDFORD (1856–). An American author and editorial writer, born at Owasco, N. Y., educated at Harvard (A.B., 1877), and admitted to the bar at Rochester, N. Y., in 1884. He was honored with membership in the National Institute of Arts and Letters. A contributor, editorially, to *Life*, and a writer for various periodicals, his work includes, also: *Sly Ballades in Harvard China* (1882); *A Little Brother of the Rich* (1890), verses; *Pirated Poems* (1890); *Cousin Anthony and I* (1895); *Lucid Intervals* (1900); *The Luxury of Children, and other Luxuries* (1904); *The Courtship of a Careful Man* (1905); *Reflections of a Beginning Husband*, (1913); *The Unrest of Women* (1913); *The War Week by Week*, being observations from *Life* (1914); *Poems* (1915).

MARTIN, ERNST (1841–1910). A German scholar in Romance and Germanic philology. He was born at Jena, a son of Eduard Martin; studied at Jena, Berlin, and Bonn, and was made professor at Strassburg in 1877, after having taught in the universities of Freiburg and Prague. He wrote a useful *Mittelhochdeutsche Grammatik* (1865; 13th ed., 1906); *Examen critique des manuscrits du roman de Renard* (1872), followed by two editions of *Reynaert* (1874), and *Roman de Renart* (1882–87), as well as the *Neue Fragmente der Gedichte von den Vos Reinaerde* (1889); *Geschichte der niederländischen Litteratur* (1870–72); *Untersuchungen zur Gralsage* (1880); *Elsässische Litteraturdenkmäler des 14ten bis 17ten Jahrhunderts* (5 vols., 1878–87); *Wörterbuch der elsässischen Mundarten* (1899); an edition of *Parcival und Titurel* (2 vols., 1900–03); an edition of *Kudrun* (2 vols., 1902); *Wolfram von Eschenbach* (1903); and *Der Versbau des Heliand und der altsächsischen Genesis* (1907).

MARTIN, mär'tăn', FÉLIX (1804–86). A French-Canadian Jesuit and author, born at Auray in Brittany. In 1842 he was sent to Canada to assist in reëstablishing Jesuit missions there. He founded St. Mary's College in Montreal; collected material for the history of Canada, and published and edited many works throwing light on the old Canadian Jesuit missions, among which are the following: *Manuel du pèlerin de Notre Dame de Bon Secours* (Montreal, 1848); *Relation des Jesuites* (1850), an enlarged edition of O'Callaghan's work; *Mission du Canada, relations inédites* (1861); *De Montcalm en Canada* (1867); and *Le R. P. Isaac Jogues* (1873). He assisted Carayon in a series of volumes on the Jesuit missions.

MARTIN, FRANÇOIS XAVIER (c.1762–1846). An American jurist and historian. He was born in Marseilles, France, and when about eighteen years of age engaged in business at St. Pierre, Martinique, then, as now, a dependency of France. In 1783 he came to the United States and settled in Newbern, N. C. Under the patronage of ex-Governor Abner Nash he began the study of law. In 1792, by request of the General Assembly, he compiled the British statutes which were in force in North Carolina at the time of the Revolution. In 1794 he made a compilation of the private acts of the Assembly, and in 1803 extended Judge Iredell's revision from 1789. Meanwhile he had translated and published Pothier on *Obligations*. In 1806–07 he represented the borough of Newbern in the State Assembly. In 1809 President Madison appointed him judge of the Territory of Mississippi, and the next year he was transferred to the Territory of Orleans. When the State of Louisiana was admitted to the Union in 1813, he became the first Attorney-General. In 1815 he was appointed to the Supreme Court and served thirty-one years. During the latter part of this time he was presiding judge. At the time of his appointment the law in force in the State was a mixture of Spanish and French statutes and decisions, into which the writ of *habeas corpus* and the system of procedure in criminal cases according to the common law had been introduced. Judge Martin's services in welding into a homogeneous whole this mass of contradictory statutes and principles gave him

the title "Father of the jurisprudence of Louisiana." During the last ten years of his life he was practically blind, but continued to do full work on the bench until superseded by the judges appointed under the new Constitution in 1845. In addition to his judicial labors, he published two volumes of *Reports of the Superior Courts of Orleans*, from 1809 to 1812 (1811 and 1813); eighteen volumes of *Reports of the Supreme Court of Louisiana* (1813–30); a *History of Louisiana* (1827); and a *History of North Carolina* (1829).

MARTIN, Fredrik Robert (1868–). A Swedish art collector and author, born in Stockholm. He was amanuensis in the State Historical Museum (1899–1902) and interpreter at the Swedish Legation in Constantinople 1903–08); gained the doctorate in Vienna (1899); and is best known for his rich collections of Oriental art, made on journeys to Siberia (1891–92), Russia, Caucasus, and Central Asia (1894–95), and to Egypt, Asia Minor, and Turkey (1895–96). In 1898–1903 the government sent him to Russia, Turkey, and other lands to locate objects of art which had been produced in Sweden. He exhibited collections at the Stockholm Exposition (1897) and at the Mohammedan Exposition at Munich (1910), where he was a commissioner. Among other works he published: *The Persian Lustre Vase in the Imperial Hermitage at St. Petersburg* (1899); *Figurale Persische Stoffe, 1550–1650* (1899); *Svenska kungliga gåvor till ryske zaren, 1647–1699* (1900); *Silfverskatter i kejserliga skatkammaren i Moskva* (1900); *Dänische Silberschätze aus der Zeit Christian IV. im kaiserlichen Schatzkammer, Moskva* (1900); *Die Persischen Prachtstoffe im Schlosse Rosenborg, Kopenhagen* (1901); *Aeltere Kupferarbeiten aus dem Orient* (1902); *A History of Oriental Carpets Before 1800* (1908), a great work; and *The Miniature Painting and Painters of Persia, India, and Turkey, 8th to 18th Century* (1912).

MARTIN, Frederick Townsend (1849–1914). An American author, brother of Bradley Martin, born at Albany, N. Y. He graduated from the Albany Law School in 1872, and became judge advocate with the rank of colonel in the National Guard. The latter years of his life were spent chiefly in Europe, and he died in London, where he had become known for his philanthropies. His writings on the subject of the life of the wealthy and the socially prominent owe their value to Martin's personal experiences. Besides contributing to magazines, he wrote: *The Passing of the Idle Rich* (1911); *My Personal Experiences of Meeting Snobs* (1911); *The Reminiscences of My Life* (1911); *Things I Remember* (1913).

MARTIN, George Madden (Mrs. Attwood R. Martin) (1866–). An American writer of stories, born in Louisville, Ky., and educated in the public schools in that city, and at home. A successful contributor of short stories to magazines, she succeeded also in winning a large audience with her books: *Emmy Lou—Her Book and Heart* (1902); *House of Fulfilment* (1902); *Abbie Ann* (1907); *Letitia, Nursery Corps, U. S. A.* (1907); *Selina, her Hopeful Efforts and her Livelier Failures* (1914).

MARTIN, Gregory (?–1582). A translator of the Bible, born at Maxfield in Sussex, England. He was educated at St. John's College, Oxford (B.A., 1561; M.A., 1565), where he was distinguished as a Hebraist and Grecian. After leaving the university, he became tutor to Philip Howard, afterward Earl of Arundel. A stanch Catholic, he encouraged the Howards to remain true to their faith. Unable to conform to the Established church, he fled to Douai in Flanders (1570), where he taught Hebrew in the English College, then just established. In 1577 he was sent to help organize the English College at Rome. In 1578 the college at Douai was moved to Rheims. There Martin spent the rest of his life in the translation of the Bible. He died October 28, 1582. The famous Douai Bible, though since revised, is still the standard among English Catholics. It was made from the Latin, collated with the Greek and the Hebrew versions. The New Testament appeared at Rheims in 1582. The Old Testament was not published till 1609–10. The whole was revised by Bishop Challoner in 1749–50. Though Martin's version was severely criticized by English Protestants, it was freely used for the authorized Protestant version made under King James.

MARTIN, Helen Reimensnyder (1868–). An American author. She was born at Lancaster, Pa.; studied at Swarthmore and Radcliffe colleges; and married Frederic C. Martin in 1889. She became known for her stories of "the Pennsylvania Dutch," the shorter ones contributed to *Leslie's*, the *Century*, the *Cosmopolitan*, the *Ladies' Home Journal*, and other magazines. Her early work was so photographic in character that it was much resented by the people among whom she had lived. She is author of *Warren Hyde* (1897); *The Elusive Hildegarde* (1900); *Tillie, A Mennonite Maid* (1904); *Sabina, A Story of the Amish* (1905); *His Courtship* (1907); *The Betrothal of Elypholate* (1907); *The Revolt of Anne Royle* (1908); *The Crossways* (1910; new ed., 1914); *When Half-Gods Go* (1911); *The Fighting Doctor* (1912); *The Parasite* (1913); *Barnabetta* (1914); *Martha of the Mennonite Country* (1915).

MARTIN, mär'tăn', Henri (1810–83). A French historian, born at Saint Quentin. Educated for the practice of law, he soon abandoned law for literature. At first he wrote historical romances and poetry, but later, with Paul Lacroix, he began the task of compiling a history of France, to be made up of extracts from different authors. One volume only was published, when Lacroix abandoned it, but Martin resolved to go on. The first volume appeared in 1833, and the undertaking was completed in 1836. Meanwhile he set to work on a history of his own, the first edition of which appeared in the years 1833–36, in fifteen volumes. The third and enlarged edition appeared between 1837 and 1854, in nineteen volumes. In 1844 the Academy of Inscriptions gave Martin a prize of 9000 francs; in 1851 he received the Gobert prize, and in 1869 was awarded the great prize of 20,000 francs by the Institute. After the fall of the Second Empire he was elected to the National Assembly, and in 1876 he was elected Senator. In 1878 he became a member of the French Academy. As an historian Martin belongs to the school of Thierry. His *Histoire de France*, which comes down to the year 1789, was later continued into the nineteenth century by the *Histoire de France moderne* (2d ed., Paris, 1878–85). He was the author of numerous other literary and historical works, but his great fame rests on the *Histoire de France*. Consult: Hanotaux, *Henri Martin* (Paris, 1885); Mulot, *Souve-*

nirs intimes (ib., 1885); Jules Simon, *Mignet, Michelet, Henri Martin* (ib., 1889).

MARTIN, Henri Jean Guillaume (1860–). A French decorative painter. He was born at Toulouse and studied under Jean Paul Laurens. He became Officer of the Legion of Honor, was awarded a "first medal" in 1883, a gold medal at the Exposition of 1889, and a grand prize at the 1900 Exposition. His works comprise: "Beauty" (1900); "Pastoral" and "The Painter" (1901); "The Painter's Muse," "The Green Country Seat" (both 1902); "The Landscape" (1903); "Labor," "The Float," "Noon," "Evening," decorative panels (1904); "Landscape," decorative panel for Rostand's house (1904). In 1903 and 1906 he painted decorations for the Capitol of Toulouse, and in 1907 "Twilight" and "Rural Scenery."

MAR'TIN, Henry Austin (1824–84). An American surgeon, born in London, England, and educated at the Harvard Medical School, where he graduated in 1845. During the Civil War he served as surgeon in the Union army, became surgeon in chief of the Second Corps, Army of the Potomac, and was later brevetted lieutenant colonel and medical director. In his practice in Boston, after the war, he made himself well known by introducing the Beaugency virus (1870), the use of the rubber bandage (1877), and tracheotomy without tubes (1878). Dr. Martin contributed largely to medical journals (especially the London *Lancet* and the *British Medical Journal*), and also to the *North American Review.*

MARTIN, mär'tăn', Henry Marie Radegonde (1852–). A French paleographer and librarian, born at Airvault (Deux-Sèvres). He became administrator of the Arsenal Library, was for a time secretary general of the international congress of librarians, and took an active part in numerous other societies. He wrote: *Le livre du roi Dancus* (1883), written under the nom de plume of Henry Martin-Dairvault; *Catalogue général des manuscrits de la bibliothèque de l'arsenal* (8 vols., 1885–1900); *L'Odyssée d'un bibliognoste* (1892); *L'Evangéliare de Sainte-Aure* (1897); *Histoire de la bibliothèque de l'arsenal* (1900), crowned by the Institute; *Procès-verbaux et mémoires du congrès international des bibliothécaires* (1901); *Observations sur la technique de l'illustration de livres du moyen âge* (1904); *Les miniaturistes français* (1906); *Le Térence des ducs* (1907); *La légende de Saint-Denis* (1909); *Les joyaux de l'arsenal* (1909); *Les peintres de manuscrits et la miniature en France* (1909); *Le Boccace de Jean sans Peur* (1911). He reëdited in 1888 Louys Gruau's *Nouvelle invention de chasse pour prendre et oster les loups de France* (published 1613).

MAR'TIN, Henry Newell (1848–96). An American biologist, born in Newry, Ireland. He was educated at University College, London, and at Christ's College, Cambridge, where he graduated B.A. in 1874 and became fellow. In 1876 he was chosen professor of biology at Johns Hopkins and director of the biological laboratory. Martin there carried out some valuable experiments on respiration in general and especially on the beating of the heart of a mammal after death. In 1890 he was elected president of the American Society of Naturalists. He edited *Studies from the Biological Laboratory of Johns Hopkins* and the *Journal of Physiology;* assisted Huxley in his *Practical Biology* (1876) and Moale in a *Handbook of Vertebrate Dissection* (1881–84); and wrote, apart from the papers above mentioned on respiration, *The Human Body* (1881) and *Observations in Regard to the Supposed Suction-Pump Action of the Mammalian Heart* (1887).

MARTIN, Homer D(odge) (1836–97). An American landscape painter. He was born at Albany, N. Y., October 28, 1836, and, except that he studied there for a few weeks under William Hart (q.v.), a landscape painter of the Hudson River School, he was practically self-taught. In 1857 he first exhibited at the National Academy, and five years later he removed to New York. In 1875 he was elected a member of the National Academy, and in 1877 he was one of the founders of the Society of American Artists. After visiting Europe in 1876, he returned in 1881, and spent five years in France, at Villerville and Honfleur. Abroad he came under the influence of Boudin and Corot. On his return to America he resided in New York, until in 1893 he went to St. Paul, Minn., where he died February 12, 1897. His interpretation of nature is always poetical; his work was at first careful in detail, but later it became far bolder in style. Sure and powerful in line, it shows a keen comprehension of form, based upon careful studies from nature. His color is subdued, often expressed in tones of mellow browns, with subtle qualities of reflected light and shade. His brush work is firm and broad, and his paintings express large spaces, both in sky and land, and are always imbued with grave melancholy. Among his best-known works are: "The Old Mill" (1860); "Old Manor House," "Adirondack Scenery" (Untermyer collection, New York); "The Iron Mine," "Evening on the Seine," and "Lower Ausable Pond," all three in the Evans collection, National Gallery, Washington; "Newport Neck" (Lotos Club, New York); "Sea at Villerville" (Kansas City Art Institute); "View on the Seine" (called by the painter "Harp of the Winds"), "Sand Dunes, Lake Ontario," and "Mounts Madison and Jefferson," all three in the Metropolitan Museum, New York; and "Lighthouse at Honfleur" and "Lake Sandford," both in the Century Club, New York. Consult: E. G. Martin, *Homer Martin, a Reminiscence* (New York, 1904); Samuel Isham, *History of American Painting* (ib., 1905); F. J. Mather, *Homer Martin, Poet in Landscape* (ib., 1912); F. F. Sherman, "Landscape of Homer Dodge Martin," in *Art in America,* vol. iii (ib., 1915); and for reproductions, D. H. Carroll, *Fifty-Eight Paintings by Homer D. Martin* (ib., 1913).

MARTIN, John (1789–1854). An English historical and landscape painter, born at Haydon, near Hexham. The only art instruction that he received was from a china painter at Newcastle. In 1806 he moved to London, at first practicing china painting. He exhibited his first picture, "Sadak in Search of the Waters of Oblivion," at the Royal Academy, in 1812; "Adam's First Sight of Eve" (1813), and "Clytie" (1814). In 1817 "Joshua Commanding the Sun to Stand Still" gained for him a premium of £100 at the British Institute. His best-known work, "Belshazzar's Feast," appeared in 1821, and won a premium of £200. Then followed the "Destruction of Herculaneum" (1822); "Seventh Plague" (1823); the "Creation" (1824); "Fall of Nineveh" (1828); "Eve of the Deluge" (1840); and many other biblical

subjects, besides a number of landscapes in water color, six of which are in the South Kensington Museum. He died in the Isle of Man, Feb. 17, 1854. Martin was much criticized for his deficiencies in drawing and color, but he had a fertile invention and pronounced originality. His best work is his illustrations to Milton.

MARTIN, Joseph (1852–). A Canadian statesman. He was born at Milton, Ontario, was educated at the Michigan State and Ontario normal schools and Toronto University, and was a public-school teacher for some years. He removed to Manitoba, and was admitted to the bar of that province in 1882, practicing his profession successively in Portage la Prairie and Winnipeg. He was elected a Liberal member of the Manitoba Legislature in 1883, was Attorney-General in the administration of Thomas Greenway (q.v.) in 1888–91, and in 1890 introduced the famous measure abolishing separate schools (see Manitoba). He was an unsuccessful candidate for the House of Commons in 1891, but in 1893–96 represented Winnipeg in that body. In 1897 he removed to Vancouver, British Columbia, was admitted to the bar of that province, sat in the Provincial Legislature (1898–1903), was Attorney-General and Minister of Education (1898–99), Premier and Attorney-General (1900), and leader of the Liberal Opposition (1902–03). He owned and edited the Vancouver *Guardian* in 1907. While in British Columbia he was prominently identified with the Asiatic Exclusion League, in 1908 was an unsuccessful candidate for the House of Commons in its interest, and the same year removed to England to practice his profession in London and enter British politics. He was elected to the British House of Commons in 1910.

MARTIN, Josiah (1737–86). An English Colonial Governor, born probably in the West Indies. He entered the British army in 1756, was promoted to be major in 1761, and lieutenant colonel in 1771. In the latter year he was appointed Governor of North Carolina to succeed William Tryon, who was transferred to New York. At first his frankness and honesty favorably impressed the people, but his stubbornness and his high opinion of the royal prerogative and of his own importance soon caused opposition. He attempted to prevent the Colony from sending delegates to the Continental Congress of 1774, but a Provincial Congress met and elected delegates in defiance of his protest. This seems to have been the first legislative body in America to meet without royal authority. After the battle of Lexington he was practically a prisoner in the palace at Newbern. Martin fled to Wilmington and then to Fort Johnston, on the Cape Fear River. On July 18, 1775, he took refuge in the British sloop-of-war *Cruiser* and attempted to administer the government from there until the next year. He was attacked by a small force of colonists, fled on board the *Cruiser*, and eventually was compelled to accompany the British fleet to Charleston in 1776. When Lord Cornwallis entered North Carolina at the head of a British force Martin was with him, and finally accompanied him to New York and from there to London, England.

MARTIN, mär'tên, Karl (1851–). A German geologist, born in Oldenburg. He studied at Munich, Leipzig, and Göttingen, where, in 1874, he became assistant in the geological museum; and after a year's teaching at Wismar in Mecklenburg was chosen professor of geology at Leyden. In 1878 he was appointed director of the geological museum of Leyden; and in 1882 became a member of the Philadelphia Academy of Natural Sciences. In 1895–96 he was rector of the University of Leyden. He wrote, besides contributions to periodicals on the geology of the Netherlands and of the East Indies: *Niederländische und nordwestdeutsche Sedimentärgeschiebe* (1878); *Tertiärschichten auf Java* (1879–80); *Bericht über eine Reise nach Niederländisch Westindien* (1888); *Reisen in den Molukken, in Ambon, den Uliassern, Seran und Buru* (1894; 2d ed., 1913); with Becker, *Geology of the Philippine Islands* (1901); *Geologischer Teil* (1903); *Vorläufiger Bericht über geologische Forschungen an Java* (1911–12).

MARTIN, Konrad (1812–79). A German Catholic theologian, Bishop of Paderborn. He was born at Geismar; studied oriental languages at Halle and theology at Munich and Würzburg; took orders in 1836; and taught in Cologne and Bonn (1844). He was appointed to the see of Paderborn in 1856, and showed great diligence in advancing Catholic educational and charitable institutions. Called to Rome in 1869, he was a member of the Vatican Council of 1870, urged the dogma of infallibility, and publicly defended it. His opposition to the government at the beginning of the *Kulturkampf* (q.v.) was so violent that he was imprisoned for a year, and in 1875 fled to Belgium, where he died. He wrote various Catholic manuals: *Drei Gewissensfragen über die Maigesetze* (1874), anonymously; *Drei Jahre aus meinem Leben* (1877; 3d ed., 1878); and *Blicke ins Jenseits* (1878). Consult Christian Stamm, *Conrad Martin, Bischof von Paderborn* (Paderborn, 1892).

MAR'TIN, Lady. See Faucit, Helen.

MARTIN, mär'tăn', Louis Aimé (1786–1847). A French writer, born near Lyons. Educated for a mercantile career, he went, against the wishes of his parents, to Paris, where he took up literature. In 1815 he was appointed secretary of the Chamber of Deputies, and not long afterward became professor of literature and ethics in the Ecole Polytechnique. In 1831 he became keeper of the Library of St. Geneviève. He published *Etrennes à la jeunesse* (1809), and *Lettres à Sophie sur la physique, la chimie, et l'histoire naturelle* (1810), in prose and verse. His most valuable work was *Education des familles* (1834), contending that to improve mankind women must be educated so that they may be able to rear men of virtue. He was the disciple and friend of Bernardin de Saint-Pierre.

MARTÍN, mär-tên', Luis (1846–1906). A Spanish Jesuit, twenty-fourth general of the order. He was born in Melgar, near Burgos, entered the Society of Jesus when 18, continued his studies, held the chair in rhetoric in Poyanne, France, and in 1877 became rector of the University of Salamanca, where he made a national reputation as a theologian. In 1891, he became assistant of the order in Spain, and in 1892, after the death of Anderledy, and on his recommendation, Martín was chosen general, removing to the official headquarters at Fiesole. His successor was Father Franz Xaver Wernz (q.v.).

MAR'TIN, Luther (1744–1826). An American lawyer and political leader, born in New Brunswick, N. J. He graduated at Princeton in 1766; taught school in Queenstown, Md.; studied law; was admitted to the bar in 1771; and prac-

ticed in both Maryland and Virginia. In 1774 he was a member of the Annapolis convention that protested against the arbitrary acts of the British crown, and throughout the Revolution he continued active on the Patriot side. In 1778 he was appointed Attorney-General of Maryland. He was one of Maryland's representatives in the Continental Congress in 1784–85. He was a delegate to the Constitutional Convention of 1787 at Philadelphia; steadfastly contended there against the establishment of a strong national government; finally left the convention altogether; and subsequently strongly opposed the ratification of the Constitution by Maryland. By his opposition to the Constitution he earned the sobriquet of "The Federal Bulldog." In 1804 he defended Judge Samuel Chase (q.v.) in the impeachment proceedings before the United States Senate, and in 1807 was counsel for Aaron Burr (q.v.). From 1814 to 1816 he was Chief Justice of the Court of Oyer and Terminer in Baltimore, and in 1818 was again made Attorney-General. He was stricken with paralysis in 1820, and, largely owing to poverty, lived thereafter at the home of his friend Aaron Burr in New York. He published *A Defence of Captain Cresap; Genuine Information Delivered to the Legislature of the State of Maryland Relative to the Proceedings of the General Convention Lately Held at Philadelphia* (1788); and *Modern Gratitude* (1801–02). Consult H. P. Goddard, *Luther Martin, the Federal Bull-Dog* (Baltimore, 1887).

MARTIN, Percy F. (1861–). An English journalist and traveler. He was educated at University College, London, and early became a newspaper correspondent in Latin America and for a short time in India. Besides contributions to newspapers, reviews, and annuals on South and Central America, he wrote: *Through Five Republics of South America* (1905), *Mexico's Treasure House* (1906), *Mexico of the Twentieth Century* (1907), *Salvador of the Twentieth Century* (1911), *Peru of the Twentieth Century* (1911), *Maximilian in Mexico* (1913), *The Sudan in Evolution* (1914).

MARTIN, Riccardo (1878–). An American operatic tenor, born at Hopkinsville, Ky. As a child he began to play the violin. In 1893 he went abroad, studying piano in Germany and singing in Italy. After a few years he returned and entered Columbia University, where he devoted himself to composition and orchestration under MacDowell. At that time he wrote a number of songs and choruses. In 1900 he settled in New York as a teacher of singing. Here Dr. Holbrook Curtis discovered his voice, whereupon he went to Florence to study with Lombardi. Having finished his vocal studies with Sbriglia and Escalais in Paris, he made his operatic début in Nantes as Faust, in 1904. The next two years he sang in Verona and Milan, where he was engaged for the San Carlo Opera Company, with which he made his American début at New Orleans in 1906. After 1907 he was a member of the Metropolitan Opera House, singing the principal lyric rôles; in 1915, after Caruso left for Monte Carlo, Martin was his temporary successor. He also sang at Covent Garden and in Mexico.

MARTIN, Robert Montgomery (c.1803–68). An English historical writer and statistician, born in Ireland. In 1820–30 he traveled in Ceylon, Africa, and India, and in 1834 published his valuable *History of the British Colonies.* He prepared for the press the papers of the Duke of Wellington, and in 1840 founded the *Colonial Magazine,* which for two years he edited. His further works include: *Political, Commercial, and Financial Condition of the Anglo-Eastern Empire* (1832); *History of the Antiquities of Eastern India* (1838); and *The Statistics of the British Colonies* (1839).

MARTIN, Sir Theodore (1816–1909). An English author. He was born in Edinburgh, and was educated at the high school and university of that city. In 1846 he became parliamentary agent in London. Among his earliest literary ventures was the volume of parodies, *Bon Gaultier's Ballads* (1845; 16th ed., 1903), written in collaboration with Prof. W. E. Aytoun. In 1858 he began his series of admirable translations with *Poems and Ballads of Goethe* (again assisted by Professor Aytoun). *Faust* appeared in 1865–66. Martin's other versions are dramas from Oehlenschläger (1854–57), the *Odes of Horace* (1860), *Catullus* (1861), the *Vita Nuova* (1862), *Faust* (1865–86), Heine's *Poems and Ballads* (1878), and *Six Books of Vergil's Æneid* (1896). The Horace renderings, in 1882 extended to include the entire works, are generally conceded to be the best yet made of that poet. They are supplemented by a booklet in the *Ancient Classics for English Readers.* His further works include: *The Life of W. E. Aytoun* (1867); *The Life of the Prince Consort* (1874–80); *The Life of Lord Lyndhurst* (2d ed., 1883); a *Life* (5 vols., 1875–80) of the Prince Consort, for Queen Victoria; *Helena Faucit, Lady Martin* (1901); *Queen Victoria as I Knew Her* (1908); and *Madonna Pia* and other plays. In 1881 Martin was elected rector of St. Andrews University. He was knighted in 1880. For Lady Martin, see the article Faucit, Helen.

MARTIN, Thomas Commerford (1856–). An American electrical engineer and editor, born in London, England. He was associated with Thomas A. Edison in his work in 1877–79 and thereafter was engaged in editorial work. From 1883 to 1909 he served as editor of the *Electrical World,* after 1909 was executive secretary of the National Electric Light Association, and in 1900–11 was a special agent of the United States Census Office. At various times he lectured at the Royal Institution of Engineers, London, the Paris Société Internationale des Electriciens, the University of Nebraska, and Columbia. In 1887–88 he served as president of the American Institute of Electrical Engineers. He is author of *The Electric Motor and its Applications* (1887; 3d ed., 1888), with Joseph Wetzler; *Inventions, Researches, and Writings of Nikola Tesla* (1893; 3d ed., 1894); *Edison: His Life and Inventions* (1910), with F. L. Dyer.

MARTIN, Thomas Mower (1838–). A Canadian landscape painter, born in London and a student there at the South Kensington Art School. He went to Canada in 1862 and settled at Toronto. He was influential in founding the Royal Canadian Academy, the Ontario Art Union, the Ontario Society of Artists, and the Ontario School of Art, of which he became director in 1877. His pictures include: "The Untamed Wilderness," "A Summer Idyl," and "Sunrise, Muskoka." He painted many pictures of Rocky Mountain and British Columbia scenery. He published *An Artist's Letters from the Rockies* (1889) and *Canada from an Artist's Point of View* (1893–95).

MARTIN, Thomas Staples (1847–1919).

An American legislator. He was born at Scottsville, Va., and thenceforth lived on a farm two miles from that town. He was a cadet in the Virginia Military Institute in 1864–65 and during much of that time was in actual service in the Confederate army. He studied at the University of Virginia in 1865–67 and was admitted to the bar in 1869. In 1895 he became a United States Senator and was reëlected for the third time for the term ending in 1919.

MARTIN, Victoria Claflin Woodhull (1838–). An American reformer, born in Homer, Ohio, a sister of Tennessee Claflin, who became Lady Cook. Victoria Claflin married, when she was 14, Dr. Canning Woodhull; the marriage was unhappy and there was a separation. In 1866 she married Col. James H. Blood; they were divorced in 1875. In 1870 Mrs. Woodhull, as she was called, with her sister formed in New York a stockbrokers' house called Woodhull, Claflin & Co., which published for several years *Woodhull & Claflin's Weekly.* In the same year she memorialized Congress in behalf of woman suffrage. In 1871 Miss Claflin was nominated for Congress and both sisters tried to vote in New York. Both had been mediums and clairvoyants and Mrs. Woodhull in this year was elected president of the National Association of Spiritualists. In May, 1872, she was nominated for the presidency of the United States by the Equal Rights party. In December of that year both sisters were arrested by the Federal authorities, charged with mailing improper matter, viz., the Beecher-Tilton scandal, published in their weekly (possibly without their knowledge). They were acquitted in June, 1873. Mrs. Woodhull lectured widely in the United States, especially on "The Human Body the Temple of God," and urged race improvement, the same standard of morality for both sexes, electoral reform, etc. In 1877 she went to England to live and there married John Biddulph Martin (died 1895), a London banker. She became editor of the *Humanitarian Magazine* and wrote on social subjects.

MARTIN, Violet ("Martin Ross") (?–1915). An Irish novelist, educated at home, at Ross, County Galway, and at Alexandra College, Dublin. She identified herself prominently with the woman suffrage movement. Her literary work began with a miscellany of articles contributed to various British periodicals. Eventually she collaborated with her cousin, Miss Edith Œ. Somerville, in a series of Irish novels. *The Experiences of an Irish R. M.* (1899), a tale racy of the soil and with a sparkle, dash, and wit that recall Charles Lever's rollicking stories, made a decided hit on both sides of the sea. Other novels in which she and Miss Somerville collaborated are: *The Real Charlotte* (1901); *The Silver Fox* (1902); *All on the Irish Shore* (1903); *Some Irish Yesterdays* (1906); *Further Experiences of an Irish R. M.* (1908); *An Irish Cousin* (1910); *Dan Russell the Fox* (1912); *In Mr. Knox's Country* (1913).

MARTIN, William Alexander Parsons (1827–1916). An American missionary and educator, born at Livonia, Ind. He graduated at Indiana University in 1846 and entered the Presbyterian Seminary at New Albany, Ind. (now McCormick, Chicago); taught classics for a year; and then went to Ningpo, China, as missionary (1850). He founded the Presbyterian mission at Peking (1863) and remained in charge for five years, until he was appointed professor of international law at the Tung-wên College of Peking, of which he was also president from 1869 to 1894. For the Chinese government he translated a number of works on international law, such as the *Guide diplomatique* (1874) and two textbooks on physics, which were especially reprinted for the Emperor. In 1880 he was sent abroad by the Chinese government to investigate the educational systems in other countries. He received the honorable title of mandarin of the third rank in 1885 and of the second rank in 1898; and in 1885 was also made the first president of the Oriental Society of Peking. From 1898 to 1900 he was first president of the Imperial University of Peking. His writings include: *The Chinese: Their Education, Philosophy, and Letters* (1881); *Evidences of Christianity* (1855, in Chinese); *The Three Principles* (1856); *Religious Allegories* (1857); *A Cycle of Cathay, or China South and North* (1896; 2d ed., 1897); *The Lore of Cathay, or the Intellect of China* (1901; 2d ed., 1912); *The Siege in Peking* (1900); *Awakening of China* (1907).

MARTIN, Sir William Fanshawe, fourth Baronet (1801–95). A British naval officer. Entering the navy in 1813, 10 years later he was appointed commander of the sloop *Fly,* in which he gave such valuable service that he was thereafter known as "Fly" Martin. He was promoted to captain in 1824, commodore in 1849, rear admiral in 1853, vice admiral in 1858, and admiral in 1863. As commander in chief of the Mediterranean in 1860–63 he greatly improved the discipline of the fleet. From 1866 to 1869 he was commander in chief at Plymouth and in 1870 was retired. He succeeded to his baronetcy in 1863.

MARTIN, Winfred Robert (1852–1915). An American Orientalist, Hispanist, and librarian, a son of William Alexander Parsons Martin. Born at Ningpo, China, he studied the humanities at Princeton University, where he received the degree of A.B. in 1872, and that of A.M. in 1875. Three years later he graduated from the law school of New York University. After a long period of study in Germany he took his Ph.D. at Tübingen in 1887. From 1888 to 1907 he was professor of Oriental languages and literatures at Trinity College (Hartford, Conn.) and from 1902 to 1907 gave instruction in Sanskrit in the mission courses of Hartford Theological Seminary. Dr. Martin's linguistic ability was very unusual, and this, coupled with his wide reading and extraordinary memory, marked him for the difficult post to which he was called in 1907, and which he held until his death—that of librarian of the Hispanic Society of America, of which he was also a member. In 1907 Trinity College gave him an honorary LL.D., and in 1911 the King of Spain made him a Knight of the Order of Isabella the Catholic.

MARTINACH, mär'tē-näg. The name of three united villages in Switzerland. See Martigny.

MARTINA FRANCA, mär-tē'nȧ frän'kȧ. A city in the Province of Lecce, Italy, situated on a hill 17 miles north-northeast of Taranto (Map: Italy, F 4). It is a comparatively modern town, with manufactures of oil. Pop. (commune), 1901, 25,007; 1911, 24,786.

MARTIN CHUZ'ZLEWIT. A novel by Charles Dickens, which appeared in 20 monthly parts in 1843 and 1844.

MARTIN DE MOUSSY, mär'tăn' de mōō'sē',

JEAN ANTOINE VICTOR (1810–69). A French physician and traveler, born at Moussy-le-Vieux. He studied medicine in Paris, and practiced in the military hospitals. In 1841 he went to Montevideo, South America, and in the nine years' siege of that place (1843–52) was director of the medical service to the French and Italian forces. After the downfall of Rosas, the dictator of Argentina, in 1852, he was employed by the government of President Urquiza to prepare a geographical description of that republic. In the execution of this task he spent four years (1855–59) in constant travel. The results of his labors are embodied in his work in three volumes, entitled *Description géographique et statistique de la confédération argentine* (1860–64), which, with the atlas accompanying it, is of the highest authority, and *Mémoire historique sur la décadence et la ruine des missions des jésuits dans le basin de la Plata* (1865). He presented to the city of Montevideo a well-equipped meteorological observatory.

MARTINE, mär'tĭn, JAMES EDGAR (1850–). An American legislator. He was born in New York City and was educated in the public schools. He engaged in farming near Plainfield, N. J., and dealt extensively in real estate and building operations. He was a candidate for various offices in New Jersey; was a warm supporter of Woodrow Wilson during the latter's governorship; and became United States Senator from New Jersey for the term of 1911–17. He attracted attention in the United States by championing the cause of the working class, particularly the miners of West Virginia and Colorado.

MARTINEAU, mär'tĭ-nō, HARRIET (1802–76). An English writer, sister of James Martineau, born at Norwich, England, June 12, 1802; educated mostly at home. She early became a convert to Unitarianism. Miss Martineau began writing when a girl, contributing her first article in 1821 to the *Monthly Repository*, the Unitarian organ. In 1829 the house in which had been placed the small fortunes of the family failed and Miss Martineau turned to literature for support. Her health had been precarious from girlhood and it now frequently broke down. For rest she visited America (1834–35) and Venice (1839). By 1845 she had passed from Unitarianism to agnosticism. In 1845–46 she settled near Ambleside by the English Lakes, where she lived till her death, June 27, 1876. Miss Martineau published 36 distinct works, comprising tales, novels, and essays on history, politics, economics, and philosophy, and contributed extensively to periodicals. In the *Daily News* alone appeared more than 1600 articles. She gained her first success with *Illustrations of Political Economy* (1832–34), a series of tales with a purpose, and *Illustrations of Taxation* (1834), in which she sought to popularize current theories through fiction. Among her other works are: *Society in America* (1837); *Western Travel* (1838); *Deerbrook*, a readable novel (1839); *The Playfellow*, good children's stories (1841); *Life in the Sick Room* (1843), autobiographical; *Letters on Mesmerism* (1845); *Eastern Life, Past and Present* (1848), in which she avowed her religious opinions; *History of England during the Thirty Years' Peace* (1849), a weighty piece of writing; *Letters on the Laws of Man's Social Nature and Development* (1851), written in conjunction with H. G. Atkinson; *The Philosophy of Comte* (1853), a condensation of the *Philosophie positive; Biographical Sketches* (1869). Though little of Miss Martineau's work has survived as a permanent literary possession, it was of great value to her generation. She was a popularizer of the advanced thinking of her day. Consult: *Autobiography, with Memorials* by M. W. Chapman (London, 1877); F. F. Miller, *Harriet Martineau* (Boston, 1890); J. F. Clarke, "Harriet Martineau," in his *Nineteenth Century Questions* (Boston, 1898).

MARTINEAU, JAMES (1805–1900). An English Unitarian divine, brother of the preceding. He was born at Norwich, April 21, 1805. He was educated for the ministry at Manchester College (Unitarian, then located at York) and was graduated in 1827. He spent one year teaching in Bristol and then, Oct. 26, 1828, he was ordained to the Presbyterian ministry in Dublin. He resigned his pastorate in Dublin because he objected to receiving state aid in the *regium donum*, though it would have increased his salary by £100. From Dublin he went to Liverpool, where he was settled over Paradise Street Chapel and eked out his income by taking pupils. Here he attracted considerable attention by engaging, along with J. H. Thom and Henry Giles, in a controversy against some clergymen of the Church of England on the subject of Unitarianism. Soon afterward Martineau was elected professor of mental and moral philosophy at Manchester New College and continued to lecture in the college when it was removed to London in 1853, though he also retained his pulpit in Liverpool for four years. In 1857 he took up his residence in London. The next year he added to his work the task of sharing the pulpit of Little Portland Street Chapel with J. J. Taylor, then principal of the college. Upon the death of Mr. Taylor in 1868 he became principal of the college and filled the chapel pulpit alone for four years, when the strain compelled him to give it up. He is the author of *The Rationale of Religious Inquiry* (1836); also *Unitarianism Defended* (in collaboration with Thom and Giles, 1839), the lectures delivered in the controversy referred to above; *Endeavors after the Christian Life* (2 vols., 1843–47); *Miscellanies* (1852); *Studies of Christianity* (1858); *Essays, Philosophical and Theological* (1866–67); *Religion as Affected by Modern Materialism* (1874); *Hours of Thought on Sacred Things* (1876–79); *Study of Spinoza* (1882); *Types of Ethical Theory* (1885); *Study of Religion* (1888); and *The Seat of Authority in Religion* (1890). He received honorary degrees from Harvard, Leyden, Edinburgh, Oxford, and Dublin. He died Jan. 11, 1900. In philosophy he was an intuitionist, maintaining that men have a power of conscience which, without aid from experience, can ascertain the higher of two conflicting motives. In theology he was, as already seen, a prominent Unitarian; but his greatest importance will probably remain in his ethical work.

Bibliography. J. H. Hertz, *The Ethical System of James Martineau* (New York, 1894); A. W. Jackson, *James Martineau: A Biography and Study* (Boston, 1900); Henry Sidgwick, *Lectures on the Ethics of Green, Spencer, and Martineau* (ib., 1902); *James Drummond, Life and Letters of James Martineau* (2 vols., New York, 1902); S. P. Cadman, "James Martineau," in *Charles Darwin and Other English Thinkers* (Boston, 1911).

MARTINELLA, mär'tē-nĕl'là (It., crane).

A famous bell which in the old days of Florence used to announce the approach or declaration of war. It is usually spoken of in connection with the *carroccio*, a famous car of large size, drawn by oxen, which accompanied the citizens to the field of battle. After war was declared the martinella rang, and when at last the army moved out the bell was placed on a car which followed the carroccio, and guided the troops by its sound.

MARTINELLI, mär'tē-nĕl'lē, Sebastiano (1848–). An Italian Roman Catholic prelate. He was born near Lucca, in the seminary of which town he received his theological education. He entered the Augustinian Order in 1863, was ordained priest in 1871, and was elected prior general of the order in 1889 and again in 1895. On the recall to Rome of Cardinal Satolli, the first Apostolic Delegate to the United States, he was appointed to succeed him, and at the same time was raised to the episcopate as titular Archbishop of Ephesus (1896). His wise and statesmanlike conduct of many difficult questions brought him during his term as delegate was generally recognized. In 1902, having been made Cardinal in 1901, he was recalled.

MARTINET, mär'tē-nā', Achille Louis (1806–77). A French engraver. He was born in Paris and was a pupil of the painter Heim and of Forster, the engraver. Many of his important plates were after the old masters, as Rembrandt's portrait by himself, Raphael's various Madonnas, and Murillo's "Nativity"; but he also engraved the works of more recent painters. Among them were "The Last Moments of Count Egmont," after Gallait; "Charles I Mocked by Cromwell's Soldiers"; and "Mary in the Desert," after Delaroche. His work is distinguished by great delicacy of line and perfect but somewhat rigid technique.

MARTINEZ, mär-tē'nĕz. A city and the county seat of Contra Costa Co., Cal., 35 miles by rail northeast of San Francisco, on the Straits of Carquinez and Suisun Bay and on the Southern Pacific Railroad (Map: California, C 5). It is an important shipping point for grain, grapes, and pears, has copper-smelting works and oil refineries, and manufactures fertilizers, lumber, and acids, etc. The city contains the De La Salle Institute of Christian Brothers, a public library, park, and fine high school, courthouse, and city hall buildings. Pop., 1900, 1380; 1910, 2115.

MARTÍNEZ, mär-tē'nåth, Enrico (c.1570–1632). A Mexican engineer, born, according to different biographers, either in Holland, Germany, or Spain. He probably received his engineering education in Spain, was appointed royal cosmographer, and went to Mexico in 1603 as an interpreter of the Inquisition. In 1607 he took charge of the construction of the canal which was to drain the valley of Mexico, a work which he completed in less than a year. This canal soon proved inadequate, however, and Martínez was eventually commissioned to deepen the cut, but died while the work was still under way. A monument to him was unveiled in Mexico City in 1883. He wrote: *Discurso sobre la magna conjunción de los planetas Júpiter y Saturno, acaecida en 24 Diciembre 1603 en Sagitario* (Mexico, 1604); *Repertorio de los tiempos, é historia natural de Nueva España* (Mexico, 1606), and a *Tratado de trigonometria.* He also designed 32 maps of the Pacific coast of Mexico.

MARTÍNEZ DE CAMPOS, mär-tē'nåth dā käm'pōs, Arsenio (1831–1900). A Spanish general and statesman, born at Segovia, Dec. 14, 1831. He served on General O'Donnell's staff in the campaign of Morocco, 1859, was with Prim during Spain's brief participation in Mexican affairs in 1861, and joined the army in Cuba in 1869, remaining until 1872. On the abdication of King Amadeus (q.v.), in 1873, he was given several important commands under the Republic, in all of which he distinguished himself by his ability. On Dec. 29, 1874, at Murviedro (Sagunto), in conjunction with General Jovellar, he proclaimed the son of the deposed Queen Isabella, Alfonso XII, King of Spain. The army followed his lead, a ministerial regency under Cánovas del Castillo was formed, and in January, 1875, the youthful Alfonso was established in Madrid and the monarchy was restored. Martínez de Campos brought the civil war to a successful issue by the defeat of the Carlists at Peña de Plata (1876), and was rewarded by the gift of the highest rank in the army. In the same year he was sent to Cuba to conduct the military operations against the insurgents. The central insurgent committee submitted in 1878, and, the insurrection being at an end, Martínez de Campos returned to Spain and became the advocate of a just and liberal policy towards the colony. Cánovas del Castillo resigned March 7, 1879, and Martínez de Campos headed a new ministry, but was unable to hold power for many months. Upon his return to office, however, Cánovas carried out the main features of the General's Cuban programme. In 1881 Martínez de Campos made a coalition with the Liberal leader Sagasta (q.v.), which lasted until 1884, and was Minister of War under him. In 1886, in 1891, and in 1899 he was president of the Senate. In 1893, as Governor of Catalonia, he was wounded by a bomb while suppressing anarchist riots in Barcelona, occasioned by the new taxes of the government, and unsuccessful attempts were made to assassinate him and his family. He was sent to Cuba as captain general upon the outbreak of a new insurrection in 1895, in the hope that he would repeat his former success as a pacificator; but he was recalled in January, 1896, and thereafter took part as a Moderate Liberal in the endeavor to bring about a reorganization of Spanish affairs and a restoration of prosperity. His conspicuous services were highly appreciated both at home and abroad. He was a Knight Grand Cross of the following orders: San Fernando, San Hermenegildo, and Military Merit, in Spain; Tower and Sword, in Portugal; and Leopold, in Austria. He was also a Knight of the Golden Fleece, in Spain; and Grand Cordon of the Legion of Honor, in France.

MARTÍNEZ DE LA ROSA, dā lā rō'sā, Francisco de Paula (1789–1862). A Spanish statesman and man of letters. He was born in Granada, March 10, 1789; studied law at the University of Granada, and was appointed lecturer on ethics there when less than 20 years old, and attained some celebrity by a series of epigrams concerning local personages, which he published under the title of *El cementerio de momo.* The French had just invaded Spain, and he entered enthusiastically into the national movement. He was employed by the Junta of Granada to procure arms and supplies at Gibraltar, and he afterward went to England on the same errand. There, in 1811, his first poem, *Zaragoza,* was published. On his return to Spain he produced, at Cadiz, a tragedy called *La*

viuda de Padilla, which was successful and was followed by a comedy, *Lo que puede un empleo*, satirizing political life. In 1813 he was returned to the Cortes from Granada and at once took a high position as an orator. He was a supporter of the constitution of 1812, on the abolition of which, in 1814, Martínez was sentenced to imprisonment for 10 years in the fortress of the Peñón de la Gomera. Released by the insurrection of 1820, he was for a short time head of the ministry, but, having become by 1823 the most unpopular man in the country through his attempt to harmonize all parties, he resigned and took up his residence in Paris. Between 1827 and 1837 he published a collection of his *Obras literarias* in five volumes. In 1830 he was permitted to return to Spain, and began to write an historical novel, *Doña Isabel de Solís*, in imitation of Sir Walter Scott. In March, 1834, he became the head of a Liberal ministry, and was the author of the royal statute of 1834 which created a constitutional government and took away the ancient privileges of the provinces. He was also influential in making the Quadruple Alliance (England, France, Spain, and Portugal), because of which Spain sent an army into Portugal to expel the pretenders Miguel and Carlos. And yet his unpopularity increased so rapidly that he resigned in 1834. On the fall of Queen María Christina in 1840 he went to Paris and resumed the composition of *Espiritu del siglo*, a work dealing with the French Revolution, which had been begun in 1835. Upon the fall of Espartero he entered in May, 1844, the Narváez cabinet, and was from 1847 to 1851 Ambassador to Paris. He died at Madrid, Feb. 7, 1862. His periods of exile at Paris threw him into contact with the leaders of the Romantic movement and he was so much impressed that after a successful attempt at a play in French, *Aben-Humeya*, he produced, on his return in 1834, *La conjuración de Venecia*, which opened the way for the Romantic drama in Spain. Consult Godard, *Martinez de la Rosa* (Paris, 1862).

MARTÍNEZ DE ROZAS, dâ rōsâs, JUAN (1759–1813). A Chilean patriot, born in Mendoza, Argentina (then Chile). He studied in a college in Mendoza and at the University of Santiago de Chile, receiving a degree in law in 1784. He was intendant of the city of Concepción for a number of years, and in 1808 the captain general, Francisco García Carrasco, made him his private secretary, in which position Rozas had opportunity to introduce many reforms. He joined the revolutionary movement in 1810 and was made a member, and later president, of the Junta of Santiago, where his popularity was very great. On account of discords among the patriots he was banished, in 1812, by José Miguel Carrera, to Mendoza, where he died. A man of advanced ideas and republican sentiments, he exercised a remarkable influence in Chile and is called the "founder and teacher of the Chilean nation."

MARTÍNEZ MONTAÑÉS, JUAN. See MONTAÑÉS, JUAN MARTÍNEZ.

MARTINI, mär-tē′nē (OF SIENA) (1439–1502). An Italian architect, born in Siena. He was attached to the courts of Urbino (1476) and Naples (1491). He is chiefly known for his translation of Vitruvius into Italian, and for the beautiful church of Madonna del Calcinaio at Cortona, begun in 1485. The present dome was added after his death by Pietro Nozzi.

MARTINI, GIAMBATTISTA (PADRE MARTINI) (1706–84). An Italian composer and writer on music. He was born at Bologna and studied the elements of music under his father and Padre Predieri, and counterpoint under Antonio Riccieri. In 1729 he entered a Franciscan monastery, after having served as choirmaster at the church of San Francesco, Bologna, since 1725. He wrote two of the most learned treatises on music of the eighteenth century—*Storia della musica* and *Saggio di contrappunto*. Many of his compositions are in manuscript at Vienna and Bologna. His fame as a teacher of composition was very great. He was a firm adherent of the Roman school of composition and wrote a considerable number of works in that style. He died in Bologna. Consult L. Busi, *Il padre, G. B. Martini* (Bologna, 1891).

MARTINI, SIMONE, wrongly called SIMONE MEMMI (?1284–1344). One of the chief painters of the early Sienese school. He was born at Siena, where he studied under Duccio, whose influence was the chief one in the formation of his art. His artistic activity falls into three distinct periods, marked by his residence at Siena, Assisi, and Avignon. From about 1320 to 1333 there are notices of payments to him for works executed for the Palazzo Pubblico and other buildings in Siena. From 1333 to 1339 he was occupied with an important series of frescoes at Assisi. In 1339 he was called by Benedict XII to the papal court at Avignon, where he was employed with his brother Donato in the decoration of the papal palace. He died at Avignon in 1344. With the exception of a few portraits his subjects were religious.

In Siena his important work is a large wall painting in the Palazzo Pubblico, a splendid "Majestas," i.e., the Madonna, surrounded by saints and angels (1315). On the wall opposite this painting is an equestrian portrait of a Sienese captain at arms, Guidoriccio Fogliano (1328), riding through the land—"mediæval pride of life incarnate," as Berenson aptly says. "The Legend of Beato Agostino Novello" in the church of St. Agostino in Siena is also ascribed to him by Berenson. A beautiful altarpiece which was formerly in the Siena Cathedral, "The Annunciation" (1333), was painted by Simone in collaboration with Lippo Memmi, and is now in the Uffizi Gallery at Florence. In the Chapel of St. Martin in the Lower Church at Assisi are a series of magnificent frescoes illustrating the legend of St. Martin and other saints. In Naples at the church of San Lorenzo is a fresco, "St. Louis of Toulouse Crowning his Brother Robert" (1324), painted when the church was completed by King Robert I. At Avignon there are fragments of frescoes attributed to him by Berenson and others. In the papal palace and cathedral and in the chapel of St. John there are frescoes illustrative of the life of that saint. The chief characteristics of his painting are its splendid decorative quality, its gorgeous yet harmonious color, its flowing line. His other works include: Polyptychs in the Opera del Duomo, Orvieto, and at Pisa (both c.1320), and in Fenway Court, Boston, and the former Avignon altarpiece, with scenes from the Passion, parts of which are in Paris, Berlin, and Antwerp. Consult Bernhard Berenson, *Central Italian Painters of the Renaissance* (New York, 1897).

MARTINIQUE, mär′tē′nēk′. An island and French colony of the Lesser Antilles, situated between lat. 14° 23′ and 14° 52′ N. and on the

meridian of 61° W., between Dominica on the north and St. Lucia on the south (Map: West Indies, G 4). Area, 381 square miles. The island is in greater part of volcanic origin, the loftier elevations (Mont Pelée, in the northwest, now about 4900 feet in elevation; the Pitons du Carbet, 3960 feet; the Vauclin, in the south) being all of lava or agglomerate masses, whose age dates back to some portion of the Tertiary period. Isolated patches of limestone, of Miocene and Pliocene age, occur in the east and in the south (near Trinité, the Marin, etc.), and there is also a detached bordering of recent coral structures. Much of the interior surface is a comparatively recent alluvium, formed from the disintegration of the prehistoric lavas. The relief of the land is essentially mountainous, the *mornes* and *pitons* rising with marked abruptness and forming the landscape that is so distinctive of most of the inner (volcanic) islands of the Lesser Antilles. Between these are valleys of beautifully flowing contour and deeply incised cañon-like troughs. The culminating point of the island is Mont Pelée, whose height has increased by nearly or fully 700 feet since May, 1902.

A large part of the island, somewhat over a third, is under cultivation. The principal crop is sugar cane, but a superior grade of cacao has been raised with success and profit; coffee, tobacco, and cotton are grown in some parts. Where not under cultivation the island is still largely covered with woodland, and a forest of strictly tropical luxuriance is found in scattered spots. The higher animal life is not very abundant, and its characteristics are largely South American, marked with the deficiencies that belong to insularity. Of the seemingly native animals the opossum, which has been known in the island for upward of 200 years, is the most notable. Of the birds the most abundant or common species is probably the Martinique blackbird. Of the dreaded fer-de-lance serpent, which was at one time very abundant, but few individuals remain to-day, the animal having been all but exterminated by the introduced mongoose.

The interior of the island is crossed by well-constructed highroads, but there are as yet no railways, excepting a few that are used in private transport on the cane plantations. The climate is on the whole salubrious, and the heat is measurably tempered, especially on the eastern side, by the steadily blowing trade winds, the temperature only exceptionally rising above 92° F. to 94° F. The humidity is, however, high. July and August are ordinarily the most rainy months, and February, March, and April the months of least rainfall. The annual precipitation is from 85 to 95 inches. Earthquakes are of frequent occurrence. That of 1839, which destroyed a large part of Fort de France, was particularly destructive. The only historically recorded volcanic eruptions that took place before the year 1902 were those of 1762 and August, 1851, both of Mont Pelée. See PELÉE, MONT.

Of the population much the greater part consists of the colored races, especially negroes and mulattoes; hardly a vestige, except in mixture, remains of the ancient Carib Indians. In 1878 the inhabitants numbered 162,861; in 1888, 175,863; in 1901, 203,781; in 1905, 182,024; in 1911, 184,084. The capital of the colony is Fort de France, which had 22,164 inhabitants in 1901 and 26,935 in 1911. Other important towns are Lamentin, Ste. Marie, Trinité, François, Robert, Gros Morne, St. Joseph, and Carbet, with populations ranging from 6000 to nearly 11,000. St. Pierre, of which nothing but ruins now remain, was, up to the time of its destruction, the largest and most important town on the island.

The colony is administered by a governor (appointed by the home government of France) and a general council, and there are elective municipal councils. It is represented in the French Parliament by one senator and two deputies. In 1890, in the general trade, imports and exports were valued at 30,261,000 and 23,350,000 francs respectively; in 1900, 24,763,000 and 26,979,000; in 1910, 19,563,000 and 27,587,000; in 1912, 21,520,000 and 30,523,000. In 1912 the trade with France amounted to 11,510,000 francs imports and 28,574,000 francs exports. In 1911 there were entered 88 vessels, of 156,000 tons. The island of Martinique was discovered by Columbus, who subsequently landed near Carbet, on June 15, 1502. In 1635 a fort was erected by the Frenchman D'Esnembuc on the site of the later St. Pierre. The English took the island repeatedly from the French, holding it for the last time during the Napoleonic wars. Slavery was abolished by decree of April 27, 1848. The Empress Josephine was born at Trois-Ilets.

Bibliography. Daney, *Histoire de la Martinique depuis la colonisation jusqu'en 1815* (Fort Royal, 1846); Rey, *Etude sur la colonie de la Martinique* (Paris, 1881); Aube, *La Martinique, son présent et son avenir* (ib., 1882); Monet, *La Martinique* (ib., 1882); Heilprin, *Mont Pelée and the Tragedy of Martinique* (Philadelphia, 1903); Dumoret, *Au pays du sucre* (Paris, 1901); Landes, *Notice sur la Martinique* (ib., 1900); Garaud, *Trois ans à la Martinique* (5th ed., Nancy, 1902); Russell, "Volcanic Eruptions on Martinique and St. Vincent," in *National Geographic Magazine*, vol. xiii, containing a bibliography (Washington, 1902).

MARTINIQUE, PETIT. See GRENADINES.

MAR'TIN MAR'PREL'ATE CONTROVERSY. A bitter religious dispute of the Elizabethan period. It was occasioned by the publication, 1588–89, under the name of Martin Marprelate, Gentleman, of a number of bitterly personal tracts directed against what the writer conceived to be abuses in Church and state, and against certain bishops in particular. The publisher and chief instigator was John Penry (q.v.), or Ap-Henry, a Puritan preacher, abetted by Sir Richard Knightley of Northamptonshire, Job Throckmorton of Warwickshire, and others. The tracts were printed on a rude and peripatetic press, at Kingston-on-Thames, Coventry, Manchester, etc., and provoked in reply a great number of abusive books and pamphlets. Martin's broad satires were disapproved by devout Puritans, but undoubtedly they were powerful factors in furthering the Puritan cause. Great efforts were made to discover and apprehend the authors. Penry was executed in 1593. Henry Barrow, one of his assistants, to whom the chief responsibility for the tracts has sometimes been attributed, also suffered death in the same year. The tracts have been reprinted by Arber in the *English Scholar's Library* (London, 1878 et seq.). Consult: William Maskell, *A History of the Martin Marprelate Controversy* (London, 1845); E. Arber, *Introductory Sketch to the Martin Marprelate Controversy* (ib.,

1879); H. M. Dexter, *Congregationalism of the Last 300 Years as Seen in its Literature* (New York, 1880); J. D. Wilson, in *Cambridge History of English Literature*, vol. iii (Cambridge, 1909); William Pierce, *Historical Introduction to the Marprelate Tracts: A Chapter in the Evolution of Religious and Civil Liberty in England* (New York, 1909).

MAR'TINMAS. A festival celebrated on St. Martin's Day, November 11. Luther was born on the eve of the festival, and therefore received the saint's name.

MAR'TIN OF TOURS, tōōr (c.316–c.400). Bishop of Tours and patron saint of France. He was born at Sabaria, Pannonia, of heathen parents, about 316. He was educated at Pavia, and at the desire of his father, who was a military tribune, entered the army at an early age under Constantine the Great. The virtues of his life as a soldier are the theme of more than one interesting legend. On obtaining his discharge from military service (336), Martin became a disciple of Hilary (q.v.), Bishop of Poitiers. He returned home and converted his mother to Christianity, but he himself endured much persecution from the Arian party, who were at that time dominant; and in consequence of the firmness of his profession of orthodoxy he is the first who, without suffering death for the truth, has been honored in the Latin church as a confessor of the faith. On his return to Gaul, about 360, he sought a hermit life in Ligugé, near Poitiers, where soon monks gathered about him and a convent was established. In 371 he was drawn by force from his retreat and ordained Bishop of Tours. The fame of his sanctity and his repute as a worker of miracles attracted crowds of visitants from all parts of Gaul; and in order to avoid the distraction of their importunity he established a monastery near Tours, in which he resided. He died at Candé (Candeum) about 400. His life is the subject of a great number of legends. In the Roman Catholic church the festival of his birth is celebrated on November 11. Consult: Chamard, *St. Martin et son monastère* (Poitiers, 1873); J. G. Cazenove, *St. Hilary of Poitiers and St. Martin of Tours* (London, 1883); Scullard, *Martin of Tours, Apostle of Gaul* (ib., 1891); *Cambridge Mediæval History*, vol. i (Cambridge, 1911).

MARTIN PROCESS. See IRON AND STEEL, *Open-Hearth Process*.

MAR'TINSBURG. A city and the county seat of Berkeley Co., W. Va., 75 miles west of Washington, D. C., on the Baltimore and Ohio and the Cumberland Valley railroads (Map: West Virginia, F 2). Its most prominent structures are the United States courthouse and post office, King's Daughters and city hospitals, and the county courthouse. The industrial interests are represented by railroad repair shops, woolen, cassimere, and hosiery mills, grain elevators, flour mills, clothing factories, distilleries, lime works, extensive slate and limestone quarries, wagon and carriage shops, lumber and planing mills, automobile works, and cement plants. The surrounding region is rich in fruit, particularly apples and peaches, and there are important live-stock and agricultural interests. The municipality is governed by a mayor, elected every two years, and a unicameral council. The executive power is vested in an appointed board of affairs. The city owns and operates the water works. Martinsburg was founded and incorporated as a town in 1778. Pop., 1900, 7564; 1910, 10,698; 1914, 12,032; 1920, 12,515.

MAR'TINS FERRY. A city in Belmont Co., Ohio, on the Ohio River, nearly opposite Wheeling, W. Va., and on the Baltimore and Ohio, the Wheeling and Lake Erie, and the Pennsylvania railroads (Map: Ohio, J. 5). It is in an agricultural, bituminous-coal, and limestone region, and, besides productive coal mines, has extensive manufactures of iron, steel, tin, glass, machinery, heaters, galvanized-iron products, stoves, boxes, and barrels. Walnut Grove Cemetery is interesting as the burial place of persons prominent in the history of the settlement of the Ohio valley. Settled about 1769, Martins Ferry was incorporated as a village in 1865. It is governed under the Ohio municipal code, which provides for a mayor, elected biennially, and a unicameral council. The water works and electric-light plant are owned and operated by the municipality. Pop., 1900, 7760; 1910, 9133; 1914 (U. S. est.), 9718; 1920, 11,634.

MAR'TINSVILLE. A city and the county seat of Morgan Co., Ind., on the White River, 30 miles southwest of Indianapolis, on the Vandalia and the Cleveland, Cincinnati, Chicago, and St. Louis railroads (Map: Indiana, E 6). It is widely noted for its artesian mineral wells and has several large sanatoriums. The city contains a Carnegie library and has flour, saw and planing mills, woodenware factory, chair factory, and brick plants. The water works and electric-light plant are owned by the municipality. Pop., 1900, 4038; 1910, 4529.

MARTINSVILLE. A town and the county seat of Henry Co., Va., 40 miles (direct) west by north of Danville, on the Norfolk and Western and the Danville and Western railroads (Map: Virginia, E 5). Attractive features of the town include the courthouse, municipal building, post-office and high-school buildings, and the Roundabout stock farm. There are cotton mills, furniture factories, tobacco warehouses, and spoke factories. Farming is also engaged in extensively. Martinsville owns its water works, electric-light and telephone plants. Pop., 1900, 2384; 1910, 3368.

MARTINUS SCRIBLERUS, mär-tī'nŭs skrĭb-lē'rŭs, MEMOIRS OF (Neo-Lat., Martin Scribbler). An extensive satire (1741), written principally by John Arbuthnot (q.v.), with Swift and Pope also among the contributors. Its aim was at one with that of the Martinus Scriblerus Club, formed by the men above named at Pope's suggestion with a view to satirizing literary dullness and incompetence. The chief monument of the association is Pope's contribution to the labors of the club—*The Dunciad* (completed 1741).

MARTINUZZI, mär'tē-nōōt'sē, GEORG (GYÖRGY UTIEŠENOVIĆ), also known in Hungarian history as FRATER GEORGIUS (or GYÖRGY) (1482–1551). A Hungarian statesman, born at Kamičic in Croatia. He entered the Pauline order in 1510; became Bishop of Grosswardein in 1534; and was consecrated Archbishop of Esztergom and made Cardinal in 1551. His political career began with his successful negotiations with Ferdinand for the return of Buda to John Zapolya, King of Hungary, in 1529. Thereafter he was treasurer and chief councilor of Zapolya, and upon the latter's death in 1540 was Regent of Hungary and guardian of the infant King, John Sigismund. He was opposed in his policies by the Queen mother, Isabella,

who sought to bring in the Austrians, but he defeated her purpose. For 10 years subsequently he brilliantly maintained a trying and perilous position between the mutually hostile Austrians and Turks; but finally he was assassinated by the permission of Emperor Ferdinand, who accused the frater of treason.

MARTINY, mär-tē'nĭ, PHILIP (1858–). An American sculptor. He was born in Alsace, where he studied under Eugène Dock. In the early eighties he came to the United States and entered the studio of Augustus Saint-Gaudens. He did much to raise the standard of decorative sculpture in the United States. His conceptions are original and spontaneous, his execution skillful, his modeling simple yet rich. Among his best-known decorative works are the sculpture for the grand staircase of the Congressional Library, Washington, for the Carnegie Library, Washington, and for the Hall of Records, New York; the bronze doors of St. Bartholomew's Church, New York; two groups in the Chamber of Commerce, New York; and figures and a fountain for Senator Clark's residence in New York. Among his monumental works are the Soldiers and Sailors Monument, Jersey City; the McKinley Monument, Springfield, Mass.; the monument to Admiral de Gernay, Newport, R. I., and the portrait statue of Vice President Hobart, Paterson, N. J.

MAR'TITE. A form of hematite (q.v.) pseudomorphus after magnetite.

MARTITZ, mär'tĭts, FERDINAND VON (1839–). A German international law scholar, born in Insterburg and educated at Königsberg and Leipzig. He taught at Königsberg from 1864 to 1872, was professor at Freiburg in 1872–75 and at Tübingen from 1875 to 1898, and then was appointed to a chair in Berlin. In 1898–1903 he was a member of the Prussian Oberverwaltungsgericht, and he was a member of the permanent Court of Arbitration at The Hague. His published works include: *Internationale Rechtshilfe in Strafsachen* (1888–97); *Die Monarchie als Staatsform* (1903); *Völkerrecht* (2d ed., 1913); and he contributed the section on international law to the volume *Systematische Rechtswissenschaft* (1913) in the Teubner series "Kultur der Gegenwart."

MARTIUS, mär'tsĭ-ụs, KARL FRIEDRICH PHILIPP VON (1794–1868). A distinguished German traveler and naturalist, born and educated in medicine at Erlangen. He went to Brazil (1817–20) as a member of a scientific expedition sent out by the Austrian and Bavarian governments, and by his researches in that country acquired a reputation second only to that of Humboldt. He was specially intrusted with the botanical department, but his researches extended to ethnography, statistics, geography, and natural science in general; and his works, published after his return, exhibited a poet's love of nature and great powers of description. He was professor of botany and director of the Botanic Garden at Munich from 1826 until he retired in 1864. Among his works are: *Reise nach Brasilien* (1824–31); *Nova Genera et Species Plantarum* (1824–32); *Icones Plantarum Cryptogamicarum* (1828–34). He also published a most valuable monograph on palms, *Historia Naturalis Palmarum* (1823–53); *Die Pflanzen und Thiere des tropischen Amerika* (1831); *Das Naturell, die Krankheiten, das Arzttum und die Heilmittel der Urbewohner Brasiliens* (1843); *Beiträge zur Ethnographie und Sprachenkunde Amerikas* (1867). Consult Meissner, *Denkschrift auf Karl F. P. von Martius* (Munich, 1869).

MARTIUS' YELLOW. See COAL-TAR COLORS.

MART'LET (probably for **marlet, *merlet,* from OF. *merlette, merlotte,* probably the dim. of *merle,* blackbird, from Lat. *merula,* blackbird). In heraldry (q.v.), a martin without legs or beak. Also used as the difference for the fourth son.

MARTOS, mär'tôs. A town of south Spain, in the Province of Jaén, situated among the mountains 15 miles southwest of Jaén (Map: Spain, D 4). It is built on the slope of a steep hill, surmounted by a ruined castle, has mineral baths and exports excellent olive oil, produced in the surrounding district. Pop., 1900, 16,682; 1910, 17,025.

MARTOS Y BALBÍ, mär'tôs ē bäl-bē', CRISTINO (1830–93). A Spanish politician, jurisconsult, and orator. Born at Granada, he studied letters and philosophy there and at Toledo and jurisprudence at Madrid. In 1851, while still a student at Madrid, he started a student rebellion against a recently decreed law concerning public instruction. The example of Madrid was followed in other university centres throughout the country, and the government dismissed from their respective universities for one year Martos and a few others of the leaders. This was the beginning of a stormy political career that obliged him to stay abroad from 1866 to 1869, when he returned and was elected to Congress. In 1874 he resumed his law practice, but in 1879 he was again elected deputy and by successive reëlections continued to serve in that capacity the rest of his life. He held various portfolios under various ministries and was for a while president of the Congress.

MARTUCCI, mär-tōōt'chē, GIUSEPPE (1856–1909). An Italian composer and pianist, born at Capua. Having received his first musical instruction from his father, a trumpet player, he entered the Conservatory of Naples in 1867. Here he studied piano and composition under Costa, Cesi, Serrao, and Rossi, graduating in 1872. Two years later he was appointed professor in that institution. As conductor of the concerts established by Prince d'Ardore he won fame. Beginning his career as a concert pianist in 1875, he visited Germany, France, and England, meeting everywhere with signal success. In 1886 he accepted the position of director at the Liceo Musicale of Bologna, where he also conducted at the Opera. Here he scored a phenomenal success in 1888, when he conducted the first performance in Italy of *Tristan und Isolde.* From 1902 until his death he was director of the Conservatory at Naples. He is one of the few modern Italian composers who have won a high rank in the field of pure instrumental music. His works include two symphonies, two concertos for piano and orchestra, a piano quintet, two piano trios, a sonata for piano and cello, several string quartets, an organ sonata, numerous compositions for piano.

MARTVYEEV, märt-vyā'ĕf, ARTAMON SERGYEEVICH (?–1682). A Russian statesman. He gained distinction as a scholar and author; became chief counselor of Czar Alexius in 1671; and attained the rank of boyar (q.v.) in 1674. When Alexius died Martvyeev proposed to have the Czarevitch Peter elevated to the throne instead of the sickly Theodore, but the hostile

boyars and relatives of Theodore proclaimed him Czar and banished Martvyeev from court. When Peter (the Great) was proclaimed in 1682, Martvyeev was summoned to court as Peter's chief adviser, but was immediately killed by rebellious musketeers. His political and educational reforms under Alexius had an important influence on the later introduction of western ideas in the reign of Peter the Great.

MARTY, mär'tē', George Eugène (1860–1908). A French composer and orchestral conductor, born at Paris. He was a pupil of Massenet at the Conservatory and in 1882 won the Prix de Rome with his cantata *Edith*. In 1892 he took charge of the ensemble classes at the Conservatory, and also acted as chorus master at the Théâtre Eden. During the season of 1895–96 he was conductor at the Grand Opéra. During his incumbency as conductor of the Concerts du Conservatoire from 1901 to his death he proved himself one of the greatest concert conductors France ever produced. His compositions include the operas *Le Duc de Ferrare* (1899) and *Daria* (1905); a pantomime, *Lysic;* an overture, *Belsazar;* a *Suite romantique;* a symphonic poem, *Merlin enchanté;* piano pieces and songs.

MARTYN, mär'tĭn, (William) Carlos (1841–). An author and Congregational minister, born in New York City. After graduating from Union Theological Seminary in 1869 his first charge was in St. Louis, and afterward he held pastorates at Portsmouth, N. H., New York City (1876–90), Newark, and Chicago (1892–94). From 1897 to 1903 he was literary director of the Abbey Press, New York. Thereafter until 1905 he lectured and served occasionally as a supply, and in 1906 he became pastor at Noroton, Conn. His work includes: *Life of John Milton* (1865); *Life of Martin Luther* (1865); *History of English Puritans* (1866); *History of the Huguenots* (1867); *The Dutch Reformation* (1869); *History of the Pilgrim Fathers* (1870); *Wendell Phillips, the Agitator* (1891), for the "American Reformers Series," of which he was editor; for the same series, *William E. Dodge, the Merchant* (1891) and *John B. Gough* (1894); *Christian Citizenship* (1896); *Sour Saints and Sweet Sinners* (1898), a novel.

MARTYN, mär'tĭn, Edward (1859–). An Irish dramatist, educated at Belvedere College, Dublin, at Beaumont College, Windsor, and at Oxford, who played an important part in the Irish literary revival. It was he who, with Lady Gregory and George Moore, founded the Irish National Theatre, and he met the expenses of its initial performances; and it was his *The Heather Field* and W. B. Yeats's *Countess Kathleen* that in 1899 inaugurated the dramatic activities which that theatre, under changing names, was creditably to continue. An ardent patriot and an ardent Catholic, his convictions color his dramatic and other writings. His plays show the Ibsen influence. His interest in music led him to establish a fund of $50,000 to found a Palestrina choir in Dublin. In addition to *The Heather Field* and a satire, *Morgante the Lesser* (published under the pen name of Sirius in 1890), Martyn wrote: *Maève* (1899); *The Tale of a Town* (1902); *An Enchanted Sea* (1902). Consult George Moore's trilogy *Hail and Farewell* (New York, 1911–13), passim, for information regarding Martyn's part in certain phases of the Irish literary revival, and see Irish Literature, *Irish Literature in English.*

MARTYN, Henry (1781–1812). An English missionary. He was born at Truro, Cornwall, England, Feb. 18, 1781, of humble origin. In 1797 he entered St. John's College, Cambridge, and in 1802 was chosen fellow of his college. After receiving ordination in 1803 he served as curate to the Rev. Charles Simeon (q.v.). In 1805 he sailed for India as chaplain in the East India Company's service, and reached Calcutta in May, 1806; in September he received his appointment to Dinapur, and soon conducted worship among the natives in their own language and established schools for their instruction. In 1809 he was stationed at Cawnpore. While here he translated the New Testament into Hindustani and Persian, the Psalms into Persian, and the Prayer Book into Hindustani. His unremitting labor in the Indian climate affected his health, and he sought restoration in a voyage to Persia. He penetrated to Shiraz, where he revised, with the aid of learned natives, his Persian and Arabic translations of the New Testament and held discussions with the native scholars, many of whom were greatly impressed. In view of the effect of his frequent discussions, and of his being engaged in a translation of the New Testament into Persian, the preceptor of all the mollahs wrote an Arabic defense of Mohammedanism. To this Martyn replied in Persian. Ill health again compelling him to change his plans, he decided to return to England, and in September, 1812, set out overland for Constantinople. At Tokat in Asia Minor his utter prostration compelled him to stop, and he died there, Oct. 16, 1812. A monument was erected at Tokat in 1856. Besides the translations mentioned he was the author of *Controversial Tracts on Christianity and Mohammedanism* (1824). The story of his brief career had a great missionary influence in both Great Britain and America. Consult: *Journals and Letters of the Reverend Henry Martyn,* edited by Samuel Wilberforce (2 vols., London, 1837); C. D. Bell, *Henry Martyn* (New York, 1881); George Smith, *Henry Martyn, Saint and Scholar, First Modern Missionary to the Mohammedans, 1781–1812* (London, 1892).

MARTYN, Thomas (1735–1825). An English clergyman and botanist, born at Church Lane, Chelsea. He graduated at Emmanuel College, Cambridge, in 1756, became a fellow of Sidney Sussex College, and was ordained priest in 1759. From 1762 to 1825 he served as professor of botany at Cambridge, succeeding his father, John Martyn, who had held the same position for 28 years. Thomas Martyn was not only a distinguished teacher of his subject in Cambridge, but was the author of several books, the best known of which was the translation and continuation of Rousseau's *Letters on the Elements of Botany,* the eighth edition of which appeared in 1815. This was the standard English text for a long period. He also wrote *The Language of Botany* (1793), a dictionary of botanical terms and notes, and was one of the editors of *A Botanical Dictionary,* which was published in the United States in 1817. Much interested in insects, he published a *Natural History of Spiders, The Coleoptera,* etc., and also extended his interest to other fields of zoölogy, publishing, among other works, *The Universal Conchologist.*

MARTYN'IA (Neo-Lat., named in honor of John Martyn, an English botanist of the eighteenth century). A genus of eight or 10 species

of unpleasant smelling, low, branching annual or thick-stemmed perennial plants with tuberous roots, belonging to the family Martyniaceæ, mostly natives of warm countries. The leaves are simple, rounded; flowers large, bell-shaped, and somewhat two-lipped, very similar to catalpa flowers, borne in racemes; the fruit is a pod

MARTYNIA (UNICORN PLANT).

with a long incurved beak; when ripe it splits into two-hooked horns, opening at the apex. The seeds are numerous, black, with a thick, wrinkled coat. *Martynia louisiana*, unicorn plant, which grows on river banks and waste places in southern Indiana and Illinois and southwestward, is cultivated in gardens for its fruit, which, when the pods are young, is used for making pickles. The leaves of this species are heart-shaped, oblique, entire, the upper alternate; corolla dull white or purple or spotted with yellow and purple; endocarp of the fruit crested on one side, long-beaked. *Martynia fragrans*, from New Mexico, has violet-purple flowers, with a rather pleasant odor, somewhat like that of vanilla.

MAR'TYR (AS., Lat. *martyr*, from Gk. *μάρτυς*, *martys*, *μάρτυρ*, *martyr*, witness; connected with Lat. *memor*, mindful, Skt. *smar*, to remember). The name given in ecclesiastical history to those who bore witness to their faith by death, though the title was not strictly confined to these, but usually extended to those who were condemned to torture, to hard labor in the mines, or to banishment. On the other hand, it was not attributed to those who sought death by self-denunciation or by public breaking of the statues of the gods. The common teaching of the Fathers was that martyrdom, hence called the baptism of blood, supplied the place of the ordinary baptism where there was no opportunity to receive the sacrament. The martyrs were specially venerated by their fellow Christians. As it was held that their superabundant merit might, in the eyes of the Church, compensate for the weakness of less perfect brethren, a practice arose by which martyrs awaiting death gave to those sinners who were undergoing public penance letters of commendation to their bishop in order that their course of penance might be shortened. (See INDULGENCE.) The death of a martyr was reported to the bishop of the place, who decided whether he was entitled to the name; this early form of canonization made him a *martyr vindicatus*. By the beginning of the twelfth century the decision was becoming more generally, and since Urban VIII (1636) has been absolutely, reserved to the Pope. The martyrs, who were the earliest saints to be honored by a special anniversary commemoration, have in later times received a special precedence in liturgical rank—their names in the litany of the saints, e.g., coming immediately after those of the Apostles. In the old Roman calendar there was a common feast of all the martyrs, of which Gregory III, when in 731 he transferred it to November 1, widened the reference to include all saints. The number of the martyrs of the early ages was undoubtedly great, although Gibbon and others have attempted to minimize it. Ruinart among older scholars and Cardinal Wiseman in modern times have given strong evidence in confirmation of the large numbers. The Roman martyrology alone contains 14,000 names.

MARTYR, PETER. A writer on early American history. See PETER MARTYR.

MARTYR, PETER. An Italian Reformer. See VERMIGLI, PIETRO MARTIRE.

MARTYRE DE SAINT SÉBASTIEN, mär'tēr' de săn sā'bȧs'tyăn', LE (Fr., The Martyrdom of St. Sebastian). An oratorio by Debussy (q.v.), first produced in Paris, May 22, 1911.

MAR'TYROL'OGY (ML. *martyrologium*, MGk. *μαρτυρολόγιον*, from Gk. *μάρτυρ*, *martyr*, martyr + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). A calendar of martyrs (see MARTYR), and sometimes of other saints, arranged in the order of months and days. It early became usual to write on diptychs or folding tablets the names of Christians, living or dead, who were to be especially commemorated in the celebration of the Eucharist. Thus were inscribed particularly the names of martyrs whose anniversaries were honored. These, which were at first only lists of names, were gradually expanded, and by combining the records of various churches complete martyrologies were made. The oldest extant martyrology is probably a Syrian one of the year 412 (see below), though the so-called *Martyrologium Hieronymianum* may be almost contemporary with it, at least in part. This has been ascribed to St. Jerome, possibly because he translated and commented upon the work of Eusebius, *De Martyribus Palæstinæ*. It was compiled in Italy, probably in the fifth century, and revised in Gaul about 600. An old Roman martyrology was known to Bede and to a contemporary French monk, Usnard, whose work forms the basis of the later Western martyrologies, as officially published in Rome by Baronius in 1586, and also in the revised editions by direction of various popes (by Pius IX in 1873).

Bibliography. Wright, *An Ancient Syrian Martyrology* (London, 1865); Lämmer, *De Martyrologio Romano, Parergon Historico-criticum* (Regensburg, 1878); the edition of the *Martyrology of St. Jerome*, in *Acta Sanctorum*, November, 1894 (Paris, 1894); Achelis, *Die Martyrologien, ihre Geschichte und ihr Wert* (Berlin, 1900); *The Roman Martyrology*, translated by F. P. Kenrick (Baltimore, 1907); Delhaye, "Le témoignage des martyrologes," in *Analecta Ballandiana*, xxvi (Paris, 1907).

MARTYRS, mär'tēr', LES. A prose work by Chateaubriand (1809). It is the story of two Christian lovers at the end of the third century, during Diocletian's persecutions.

MARUCCHI, mȧ-rōōk'kē, ORAZIO (1852–). An Italian archæologist. He was born in

Rome and became an eminent authority on Egyptology and on Christian archæology, especially of the city of Rome. He was director of the Egyptian museum in the Vatican and of the Christian museum of the Lateran, and filled the chairs of Christian archæology in the College of San Apollinare and the University of Rome. Marucchi was editor of the *Nuovo Bulletino di Archeologia Cristiana* (1895), which carried on the work of De Rossi; and he published *Gli obelischi egiziani di Roma* (1898); *Il museo egizio vaticano* (1899); *La santita del matrimonio confermata degli antichi monumente cristiani* (1902); *Le catacombe romane* (1905, also in French); *Manuale di archeologia cristiana* (1908); *Epigrafia cristiana* (1910); *I Monumenti del museo cristiano pio-lateranese* (1910); *Guide du Forum romain et du Palatin* (1911); *Il cimitero di Priscillo*, etc. (1913).

MARUÉJOULS (Pierre Adolphe) Emile (1837–1908). A French statesman, born at Villefranche-de-Rouergué (Aveyron). He studied law at Paris, and in 1889 was elected deputy from Villefranche and thereafter was successively reëlected. He was a member of the consulting committees on railways and of the superior councils on fine arts and commerce. In 1898, in the Brisson ministry, he was Minister of Commerce and Industry, and from 1902 to 1905, in the Combes ministry, he was Minister of Public Works. He served as chairman of the French delegation at the International Railway Congress which met in Washington in 1905. An Officer of the Legion of Honor and the recipient of decorations from numerous foreign governments, he contributed to several reviews and periodicals, such as *La Gazette des Beaux-Arts* and *Le Temps*. In 1869 he was awarded a prize for eloquence by the French Academy.

MARULIĆ, mä-rōō′lĭsh, Marko (1450–1524). A Croatian poet and scholar, born at Spalato. He studied at Padua and entered a monastery in his native town. His works in Latin deal with politics, theology, and history; the best known was *De Institutione Bene Vivendi* (probably first printed in 1506), which passed through many editions and was translated into several languages. More important than his Latin and Italian works are his poems in the vernacular, which mark him as the "father of Croatian poetry" and one of the great names of the literature of Ragusa. The best known is an epic on the *History of Judith* (Historija sv. Judite), written in 1501 but published 20 years later. He also wrote some mystery plays (*prikazanija*), which are the first dramatic composition in Croatian. His works in the vernacular were republished at Agram (1869) by Kukuljević-Sakćinski, with a biographical sketch of Marulić.

MARUTS, mä-rōōts′ (Skt., probably the shining ones). In Hindu mythology, the gods of the storm and the wind. They play a prominent part in the *Rig-Veda*, especially as allies or associates of Indra (q.v.), and vary in number, usually thrice seven or thrice sixty. The hymns addressed to them, as they crash through the forests, make the mountains quake, or sweep the plain, accompanied by lightning, dust, and rain, are among the most spirited in the *Veda*. They have been translated by Max Müller, *Sacred Books of the East*, vol. xxxii (Oxford, 1891). In post-Vedic times Marut is used in the singular, meaning wind or the god of the wind. Consult A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897), and W. J. Wilkins, *Hindu Mythology* (London, 1900).

MAR′VEL, Ik. The pseudonym of Donald G. Mitchell.

MAR′VELL, Andrew (1621–78). An English poet and politician. He was born March 31, 1621, at Winestead, Yorkshire; attended the grammar school at Hull, of which his father became master; graduated B.A. at Trinity College, Cambridge (1638); traveled on the Continent (1642–46); returned to England about 1650; was tutor to Lord Fairfax's daughter Mary; became assistant to Milton in his Latin secretaryship of state (1657); and was elected to Parliament from Hull (1659). From 1663 to 1665 he was secretary to Charles Howard, first Earl of Carlisle, on his embassy to Muscovy, Sweden, and Denmark. Without fortune or influence, possessing no commanding talent as a speaker, he maintained a character for integrity so genuine and high that his constituency felt itself honored by his conduct, and allowed him to the end of his life "a handsome pension." Charles II made fruitless efforts to win him over to the court party. Marvell died Aug. 18, 1678. Marvell was a man of varied talents and of poetic genius. He was a competent man of affairs. As a potent pamphleteer, his reputation was high among his contemporaries, but his controversial writings make little appeal to posterity. His satires have shared much the same fate as his pamphlets, because they are bound up, as lampoons, with incidents and people of his day now forgotten, and partly because their humorous exaggeration, mordant irony, and comic verve cannot atone for artistic failings. In his best poetry Marvell rises, as Lamb well says, "to the highest strains of passion and imagination," abjuring the conceits, the mere fanciful ingenuity, and the witty delicacy which give a certain quaint attraction to his verse, but frequently obscure the meaning. The high-water mark of his poetry is the "Horatian Ode" to Cromwell, but his many and varied lyrics, such as "The Garden," "A Drop of Dew," "To his Coy Mistress," "The Bermudas," and "Young Love," are, of their kind, faultless. His works were published as follows: *Miscellaneous Poems* (1681); *Works* (2 vols., 1726), edited by Thomas Cooke; *Works*, including letters and prose pamphlets (3 vols., 1776), edited by Edward Thompson; *Works*, including prose works and letters, as well as poems, with annotations, in Fuller Worthies Library, 3 vols. (1872, 1875), edited by Dr. Grosart; *Poems and Satires* (2 vols., 1892), edited by G. A. Aitken; *Poems and Satires* (1904), edited by Edward Wright. Consult the *Life* by Dove (London, 1832); the critical biography by Augustine Birrell, in "English Men of Letters Series" (ib., 1905); John Brown, in *Cambridge History of English Literature*, vol. vii (Cambridge, 1911).

MAR′VEL OF PERU, pĕ-rōō′. A garden plant. See Jalap.

MARVELOUS BOY, The. A title given to Thomas Chatterton.

MARVIN, Charles Frederick (1858–). An American meteorologist, born at Putnam, Ohio. In 1883 he graduated from Ohio State University and in the following year he was appointed on the civilian corps of the signal service of the United States. In 1903 he became professor of meteorology in the Weather Bureau, and in 1913 chief. He conducted important experiments for determining the amount

of moisture in the air and for measuring wind velocities and pressures; invented instruments for automatically measuring and recording rainfall, snowfall, sunshine, and atmospheric pressure; made investigations furthering the use of kites in meteorology; and aided the advancement of seismological and solar radiation experimentation. He contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA, and is the author of numerous pamphlets and papers published by the Weather Bureau and scientific magazines, under such titles as *Anemometry, Barometers and the Measurement of Atmospheric Pressure, Kite Experiments at the Weather Bureau and the Mechanics and Equilibrium of Kites, The Collection and Measurement of Precipitation, Psychrometric Tables and the Measurement of Vapor Pressures at Low Temperatures, The Collection and Measurement of Precipitation with Special Reference to Snowfall.*

MARVIN, ENOCH MATHER (1823–77). An American bishop, born in Warren Co., Mo. He was a self-educated man. He entered the ministry of the Methodist Episcopal church in 1841, joining the Missouri Conference, but at the time of the division of the church in 1844 identified himself with the Church South. For a time he was agent for St. Charles College. During the Civil War he served for two years as chaplain with the Confederate army, under General Price. In 1866 he was elected a bishop of the Methodist Episcopal Church South; in 1877 he completed a missionary tour around the world. He was a noted preacher and was the author of *Errors of the Papacy and Transubstantiation* (1860); *The Life of William Goff Caples* (1871); *Sermons* (1876); *The Doctrinal Integrity of Methodism* (1878); *To the East by Way of the West* (1879); *The Methodist Episcopal Churches, North and South* (n. d.). Consult T. M. Finney, *The Life and Labors of Enoch Mather Marvin* (St. Louis, 1880).

MARWAR, mär'wēr. A native state of India. See JODHPUR.

MARX, märks, ADOLF BERNHARD (1795–1866). A German writer on musical subjects, born at Halle. He studied law and practiced it for a short time, but soon devoted himself exclusively to music and became editor of the Berlin *Allgemeine Musikalische Zeitung.* In 1830 he was made professor of music at the Berlin University and in 1832 obtained the post of musical director at the university. Together with Kullak (q.v.) and Stern he founded in 1850 the Sternsche Konservatorium, which is still one of the foremost music schools of Germany. His works include: *Die Lehre von der musikalischen Komposition* (1837–45); *Allgemeine Musiklehre* (1839; 10th ed., 1884); *Ludwig van Beethoven: Leben und Schaffen* (1859; 4th ed., 1884); *Gluck und die Oper* (1862); *Das Ideal und die Gegenwart* (1867).

MARX, KARL (1818–83). A great economist and socialist, properly to be regarded as the founder of the modern Socialistic movement. He was born of Jewish parents at Treves, Germany, May 5, 1818, and educated at the universities of Bonn and Berlin. In 1842 he joined the staff of the *Rheinische Zeitung für Politik, Handel und Gewerbe,* a Liberal organ, and for a short time he was editor of the paper. Shortly before the suppression of the paper, in 1843, Marx withdrew from the editorial force and removed to Paris, where he assisted in editing the *Deutsch-Französische Jahrbücher,* and lived in close association with the French Socialistic group, of which Proudhon was the leader. Here he became acquainted with Friedrich Engels, with whom he was associated throughout the remainder of his life. In 1845 he was expelled from Paris at the instance of the Prussian government and removed to Brussels, where he remained for three years, deeply engaged in economic study. One of the fruits of his labors here was his controversial work on Proudhon, the *Misère de la philosophie,* in which he criticizes his former associate unsparingly.

In 1847 Marx and Engels entered into relations with a revolutionary association in England known as the Communist League, which held a Congress in 1847 and issued a program composed by Marx and Engels, known as the Communist Manifesto. This document was published in most of the languages of Europe and became practically the creed of the Socialistic revolutionaries. It advocated the following measures: (1) Abolition of property in land and the application of all rents to public purposes; (2) a progressive income tax; (3) abolition of all rights of inheritance; (4) confiscation of all property of emigrants and rebels; (5) centralization of credit in the hands of the state by means of a national bank with state capital and an exclusive monopoly; (6) nationalization of means of communication and transportation; (7) extension of productive enterprises by the state, the reclamation of waste land and general improvement of the soil; (8) compulsory labor, with establishment of industrial armies especially for agriculture; (9) combination of agriculture with manufacturing, the elimination of distinction between town and country by more even distribution of the population; (10) free education in public schools and abolition of child labor in factories.

In 1848 Marx returned to Cologne and started the *Neue Rheinische Zeitung,* but because of his revolutionary activity he was ordered to leave Germany in May, 1849. He went to Paris, but later in the year was forced to leave that city and moved to London, which was henceforth his home. He became a newspaper correspondent, writing for the New York *Tribune, Putnam's Monthly,* and other papers, a number of his articles subsequently being published in pamphlet form. Among these are: "Der 18te Brumaire des Louis Bonaparte" (1852); "The Life of Palmerston" (1850); "Palmerston and Poland" (1853). In 1859 he published his *Kritik der politischen Oekonomie* (translated into English, 1904), which contained the essence of the principles elaborated in his subsequent work, *Das Kapital.*

In 1864 Marx at last found the opportunity of realizing a plan he had long contemplated—that of organizing the laborers of the civilized world into a great association. On September 28 there was a great meeting in St. Martin's Hall, to which Marx outlined his scheme of an "International Workingmen's Association" (q.v.). During these years Marx was also greatly interested in the developments in Germany and assisted Liebknecht and his associates in establishing the Social Democratic Labor party in 1869. In 1867 appeared the first volume of *Das Kapital* (English translation, 4th edition, from the 3d German edition, London, 1891). The second volume was completed by Engels and published in 1885; the third in 1895. The style is heavy, and the analysis detailed and difficult. Marx seeks to

discover the economic law that governs society. Modern social development is made possible only by capital; it has reached its highest point and must necessarily be followed by another system. Modern capitalism exploits the laborer by getting possession of the "surplus value" of his services, i.e., the amount produced by him over and above the amount of his wages, which are regulated by the "iron law" and tend therefore to a minimum. The basis of the exchange value of a commodity is the amount of labor expended on it. In the long run this means the average amount of labor expended under average conditions. Marx traces the historic development of capital and shows the tendency for the instruments of labor to concentrate in fewer and fewer hands. Thus arises the capitalistic class. Meantime develops also a class who have only their labor to sell, the proletariat. The growth of capitalism reduces the number of capitalists and increases the poverty and misery of the working classes, but also serves to bring them to self-consciousness. The proletariat will finally organize and the means of production will be seized and managed for the good of all. Marx outlined no ideal future condition. He tried to show what he believed to be the course of historical development and sought to bring about the next step, the organization of all laborers for their common good. Marx died in London, March 14, 1883.

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MA'RY (Gk. Μαριάμ, *Mariam*, Μαρία, *Maria*, from Heb. *Miryām*, of uncertain etymology), THE MOTHER OF JESUS. Apart from what is contained in the narratives of Jesus' birth and childhood (Matt. i–ii; Luke i–ii), very little is told of Mary in the New Testament. If the genealogy in Luke iii. 23–38 is intended to be that of Mary (which is doubtful), she was descended from David. She was also related to the priestly family to which Elizabeth, mother of John the Baptist, belonged. (See Luke i. 5, 36.) After her betrothal to Joseph, a carpenter of Nazareth in Galilee, but before her marriage, she was informed in an angelic vision that she would through miraculous conception give birth to a son who should reign on the Davidic throne and be called the Son of the Highest. (Luke i. 26–38.) The marriage to Joseph took place. Jesus, her first-born son, was born at Bethlehem, whither she had gone with Joseph in consequence of a census decreed by Augustus. (Luke ii. 1–6.) Compelled to flee into Egypt with the infant Jesus, Joseph and Mary returned to Nazareth after the death of Herod the Great. (Matt. ii. 13–23.) Here some have believed that other children, Jesus' brothers and sisters (cf. Mark vi. 3; Matt. xiii. 55), were born; though the belief in her perpetual virginity has been a part of traditional theology from early times. Soon after Jesus began his public ministry the family—Joseph was apparently dead—moved to Capernaum. (John ii. 12; cf. Matt. iv. 13, ix 1.) To what extent Mary accompanied Jesus on his journeys we do not know. That she did not fully comprehend the mission of her son is evident from John ii. 4, if not from Mark iii. 31–35. (Cf. Luke ii. 48–49.) She witnessed the crucifixion and was then intrusted by Jesus to the care of John, the beloved disciple, who gave her a place in his home. (John xix. 25–27.) The last notice of Mary in the New Testament is in Acts i. 14, where she is mentioned as one of the company of disciples who were accustomed to meet in the upper room in Jerusalem soon after the Resurrection.

No more than this is told of her in the New Testament; but the tradition of the Christian Church added much to it. There grew up a literature, partly apocryphal (see APOCRYPHA), dealing with her infancy and childhood, with her espousal to Joseph, and with the birth and infancy of Jesus, and with her death and assumption into heaven. The more her position in the scheme of redemption was meditated upon, the more important did she appear. The frequent controversies as to the nature of her son bore upon her own personality and history; thus the Council of Ephesus (431) really summed up its doctrine against Nestorius in calling Mary the "mother of God" (θεοτόκος). Festivals celebrated in her honor increased in number; among the older ones, some of which date back to the fifth century, are the Purification, February 2; Annunciation, March 25; Assumption, August 15; Nativity, September 8; and Conception, December 8. The devotion to her not simply as an historical memory, but as a living power, owing to the prevailing force of her intercession with her son, became so marked in course of time that it was one of the things against which the reformers of the sixteenth century strongly protested. It continued to develop, however, in the Roman Catholic church, and found expression, among many other ways, in the definition in 1854 of her conception as immaculate, or free from the taint of original sin, a doctrine suggested as early as Augustine, and long held by the Catholic church; and the prayer in which her intercession is invoked (see AVE MARIA) became second only to the Lord's Prayer in frequency of use. Many of the shrines erected in her honor, at places supposed to have been consecrated by apparitions of her presence, have become among the most celebrated pilgrimage places. On this aspect of the devotion, see the articles LOURDES; EINSIEDELN.

Bibliography. Northcote, *Celebrated Sanctuaries of the Madonna* (London, 1868); Rudniki, *Die berühmtesten Wallfahrtsorte der Erde* (Paderborn, 1891). For the subject in general, consult the immense collection of documents in Bourassé, *Summa Aurea de Laudibus Beatæ Mariæ Virginis* (13 vols., Paris, 1866 et seq.); J. H. Newman, *Development of Christian Doctrine* (London, 1845); Kurz, *Marieologie* (Regensburg, 1881); A. B. M. Jameson, *Legends of the Madonna* (Boston, 1881); J. S. Northcote, *Mary in the Gospels* (London, 1885); Lehner, *Die Marienverehrung in den ersten Jahrhunderten* (2d ed., Stuttgart, 1886); Philip Schaff, *Creeds of Christendom* (New York, 1890); E. M. Hurll, *The Madonna in Art* (Boston, 1897); J. B. Terrien, *La mère de Dieu et la mère des hommes d'après les Pères et la théologie* (4 vols., Paris, 1900–02).

On the narratives of the infancy of Jesus in

the Gospels, consult Resch, "Das Kindheitsevangelium," in Gebhardt and Harnack, *Texte und Untersuchungen* (Leipzig, 1897); Sir W. M. Ramsay, *Was Jesus Born in Bethlehem?* (London, 1898). See also ASSUMPTION OF THE VIRGIN MARY; IMMACULATE CONCEPTION; MADONNA; ROSARY.

MARY I (1516–58). Queen of England from 1553 to 1558. Mary was born at Greenwich, Feb. 18, 1516, and ultimately was the only surviving child of Henry VIII by Catharine of Aragon. Her education was carefully and severely planned, and she learned to converse readily in Latin, French, and Spanish, and knew Italian. When two years of age she was betrothed to the Dauphin of France, afterward to her cousin, Charles V, and finally a treaty was signed providing for her marriage to either Francis I or his second son, Henry. Numerous other proposals were made, but they were rendered futile by the rapid changes in England's foreign relations or by Mary's refusal of a Protestant, until in the end her accession as Queen left her at liberty to choose her own consort. She was twice in danger, owing to her religious convictions—during the period of the divorce of her mother and during the reign of her brother, Edward VI (q.v.). She was a loving child and refused to abandon her mother's cause when Henry VIII divorced Catharine. In the end she was persuaded by her friends with the greatest difficulty to submit to Henry's demands and sign a renunciation of the Pope's authority and her own legitimacy. As a result of her compliance she was received into half favor and given a place in the succession to the crown. During Edward's reign she held uncompromisingly to the old faith, at the cost of much annoyance and the danger of actual persecution. In 1553 she succeeded to the crown, her popularity greatly increased by the attempt of Northumberland to displace her with Lady Jane Grey (q.v.).

Mary began her reign firmly resolved to sweep away the religious innovations of her father and half brother. She proceeded throughout in a legal manner and never failed to secure the consent of Parliament to her acts, though during the Tudor period Parliament very imperfectly represented the sentiments of the English people. The mass was restored without opposition in 1553, and the authority of the Pope reëstablished somewhat tardily and reluctantly in 1554. Mary could not persuade the Parliament to restore the Church lands, but she gave back such property as was still in the possession of the crown. This was a greater proof of her sincerity than of her statesmanship, for it impoverished her resources and led to subsequent disasters which touched English pride. Even more disastrous was her marriage in 1554 with Philip, son of Charles V, which was so unpopular that on its proposal a formidable rebellion broke out under the leadership of Wyatt to depose Mary and put Elizabeth on the throne. Philip, who was 11 years younger than Mary, was an uncompromising Catholic. He was extremely unpopular, and repaid Mary's boundless devotion with coldness and neglect. To please him the Queen joined in a war against France, with the result that Calais, the last remnant of the English conquests during the Hundred Years' War, was lost in 1558. It was no disaster of any consequence to England, but to Mary and her subjects it seemed irreparable. In addition to her husband's neglect, the loss of Calais, and her own ill health, Mary's last days were darkened by the religious persecutions which filled the latter part of her reign, in which nearly 300 persons were burnt for their faith and for which she received the name of Bloody Mary. It should not be forgotten that she adopted these measures with reluctance, as a last resort, and that her predecessors and successors were guilty of like practices. She died without issue, Nov. 17, 1558. Consult: John Lingard, *History of England* (6th ed., London, 1854–55); J. M. Stone, *The History of Mary I, Queen of England* (ib., 1901); J. B. Mullinger, "Philip and Mary," in *Cambridge Modern History*, vol. ii (Cambridge, 1904), containing a bibliography; Martin Hume, *Two English Queens and Philip* (New York, 1908); J. A. Froude, *The Reign of Mary Tudor* (ib., 1910).

MARY II (1662–94). Queen of Great Britain. She was born at St. James's Palace, April 30, 1662, the eldest daughter of James II and Anne Hyde, who was a daughter of the Earl of Clarendon. At the age of 15 she was married to William, Prince of Orange. She joined her husband in England early in 1689 after the flight of her father. In the same year Parliament declared the crown of England vacant by the abdication of James, and conferred it upon William (III) and Mary. She died of smallpox Dec. 28, 1694. Consult: Gilbert Burnet, *Essay upon the Life of Queen Mary* (London, 1695); Doebner (ed.), *Memoirs and Letters of Mary II, Queen of England* (Leipzig, 1886); R. S. Rait, *Five Stuart Princesses* (New York, 1908); M. Morris, *Reign of William and Mary* (ib., 1910); E. and M. S. Grew, *The Court of William III* (Boston, 1910). See WILLIAM III.

MARY (1867–), Queen Consort of George V (q.v.) of England.

MARY, APOCALYPSE OF THE VIRGIN. See APOCRYPHA, *New Testament.*

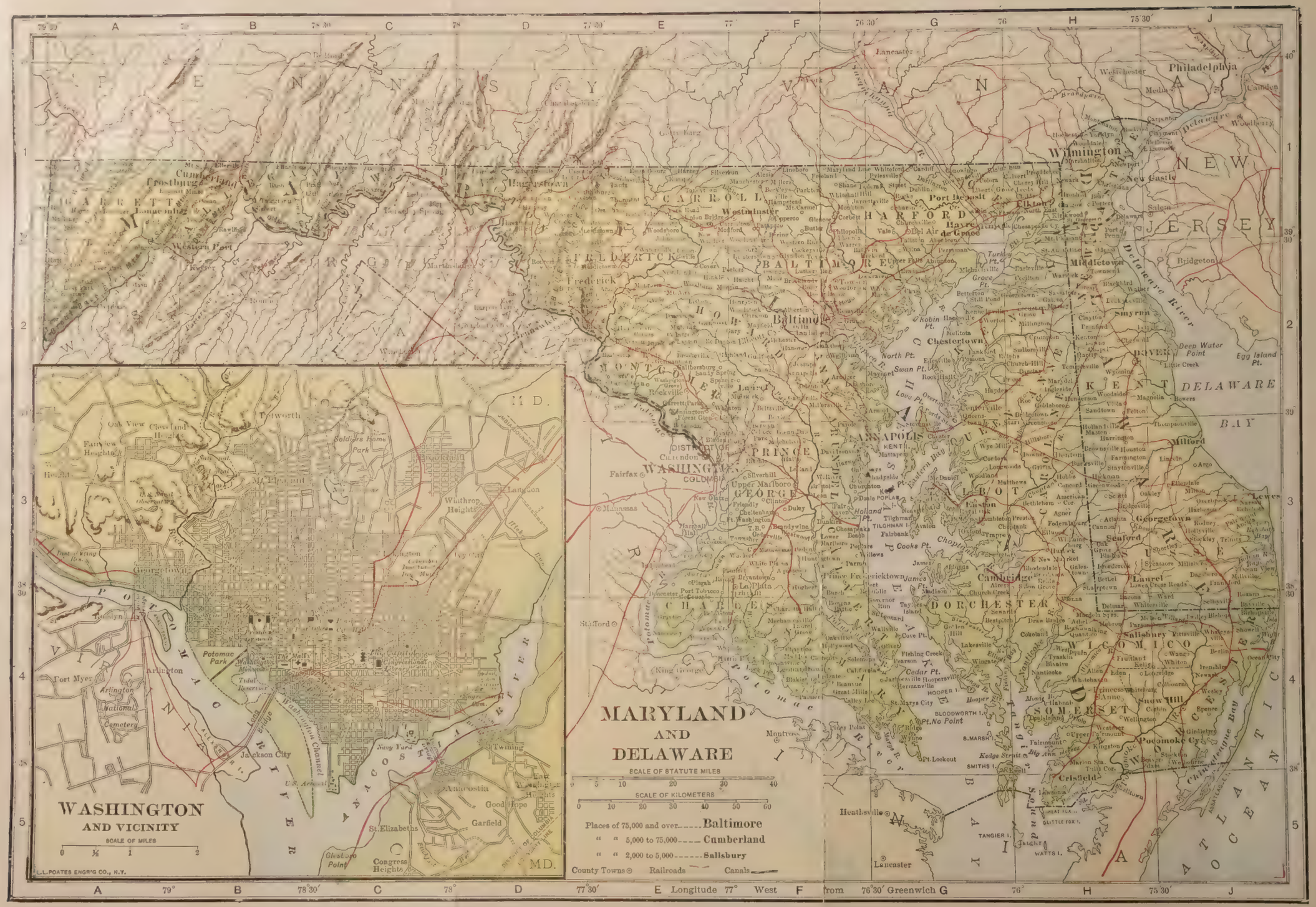
MARY, NATIVITY OF THE VIRGIN. See APOCRYPHA, *New Testament.*

MARY, OF BETHANY. See MARTHA AND MARY, OF BETHANY.

MARYBOROUGH, mā'rĭ-bŭr'ô. A seaport municipality of March Co., Queensland, Australia, on the Mary River, 180 miles north of Brisbane, with which it has railroad communication (Map: Queensland, H 8). Among its institutions are a college, a library, and St. Paul's Anglican Church. It is the port of a rich coal, gold, and copper mining and agricultural region; has sugar mills and refineries, iron foundries, breweries, tanyards, boot, shoe, and soap factories, saw mills, shipbuilding industries, active fisheries, and a considerable export trade in timber, sugar, and minerals. The wharves are available to vessels of 17½ feet draft. Pop., 1901, 10,159; 1912, 11,626.

MARYBOROUGH. A municipality of Talbot Co., Victoria, Australia, 112 miles north of Melbourne by rail (Map: Victoria, C 5). It has fine government buildings, botanical gardens, and parks. Its industries include agriculture and important quartz and alluvial gold mines. Pop., 1901, 5633; 1911, 5675.

MARY'LAND, mĕr'ĭ-*l*and. One of the thirteen original States of the American Union. It occupies a middle position on the Atlantic coast between Pennsylvania and Virginia, being included between lat. 37° 53′ and 39° 43′ 26″ N. and long. 75° 4′ and 79° 33′ W. It is bounded on the north by Pennsylvania, the boundary being Mason and Dixon's line, and by Delaware;


MARYLAND
AND
DELAWARE
SCALE OF STATUTE MILES
0 5 10 20 30 40
SCALE OF KILOMETERS
0 10 20 30 40 50 60
Places of 75,000 and over ----- Baltimore
" " 5,000 to 75,000 ----- Cumberland
" " 2,000 to 5,000 ------ Salisbury
County Towns ⊙ Railroads Canals
WASHINGTON
AND VICINITY
SCALE OF MILES
0 ½ 1 2
L.L. POATES ENGR'G CO., N.Y.
Longitude 77° West from 76°30′ Greenwich
PENNSYLVANIA
NEW JERSEY
DELAWARE
DELAWARE BAY
ATLANTIC OCEAN
Philadelphia
Wilmington
Baltimore
Annapolis
Cumberland
Frederick
Hagerstown
Westminster
Chestertown
Easton
Cambridge
Salisbury
Snow Hill
Pocomoke City
Crisfield
Milford
Lewes
Georgetown
Seaford
Laurel
Washington
Georgetown
Arlington
Alexandria
Anacostia
Potomac River
Chesapeake Bay
Delaware River
Susquehanna River
Patuxent River
Choptank River
Nanticoke River
Pocomoke River
Chincoteague Bay
Sinepuxent Bay
Assawoman Bay
Indian River Bay
Rehoboth Bay
Deep Water Point
Egg Island Pt.
Cedar Pt.
Pt. No Point
Pt. Lookout
Kedge Strait
Big Ann
Smiths I.
Tangier I.
Watts I.
Great Fox
Little Fox
Heatlsville
Lancaster
Montross
Fairfax
Manassas
Leonardtown
Upper Marlboro
Rockville
Ellicott City
Chestertown
Easton
Cambridge
Salisbury
Snow Hill
Pocomoke City
Crisfield
Milford
Lewes
Georgetown
Seaford
Laurel
Cumberland
Frederick
Hagerstown
Westminster
Baltimore
Annapolis
Wilmington
Philadelphia
Washington
Georgetown
Arlington
Alexandria
Anacostia
Potomac Park
Washington Monument
The Mall
Capitol
Congressional Library
Tidal Reservoir
Washington Channel
Navy Yard
Long Bridge
Jackson City
Arlington National Cemetery
Fort Myer
Soldiers Home Park
Brookland
Langdon
Twining
Good Hope
Garfield
St. Elizabeths
Congress Heights
Giesboro Point
Anacostia River
Potomac River
Rock Creek
Tenleytown
Chevy Chase
Cleveland Park
Fairview Heights
Oak View
Brentwood
Mt. Pleasant
Takoma
Takoma Park
Hyattsville
Bladensburg
Benning
Deanwood
Eastern Branch
Piney Branch
Soldiers Home
Rock Creek Park
Anacostia Park
Potomac Park
Washington Channel
Navy Yard
Long Bridge
Jackson City
Arlington National Cemetery
Fort Myer
Arlington
Georgetown
Tenleytown
Brookland
Langdon
Twining
Good Hope
Garfield
St. Elizabeths
Congress Heights
Giesboro Point
Anacostia
Anacostia River
Potomac River
Rock Creek
Piney Branch
Eastern

on the east by Delaware and the Atlantic Ocean; on the south and west by West Virginia and Virginia. It is separated from the two last-named States by the Potomac River, which is the boundary from its source in a small mountain stream to its mouth in a broad estuary entering the Chesapeake Bay. The outline of the State is extremely irregular, as the southern boundary is mainly a winding river, while, in addition to this, Chesapeake Bay divides the eastern half into two parts. The extreme length of the northern boundary is 205 miles, with a further extension of 35 miles where the State stretches eastward south of Delaware to the ocean. The extreme breadth from north to south, near the eastern shore of the Chesapeake, is 128 miles, while it is only about 2 miles across near Hancock. The total area is 12,210 square miles, of which 2319 square miles are water.

Topography. The surface of Maryland shows great diversity. It is usually divided, for purposes of classification, into three regions: the coastal plain, the piedmont plateau, and the Appalachian province. All are drained by the rivers flowing into the Chesapeake, excepting the northwest corner, which drains towards the Ohio, a narrow strip draining directly into the Atlantic, and a fragment at the extreme northeast draining into Christian Creek and the Delaware.

The coastal plain embraces that part of Maryland lying to the east of a line passing from Washington to Baltimore, Havre de Grace, and Wilmington. It includes more than half the land area of the State and is divided by Chesapeake Bay into what is commonly called the "eastern shore" and the "western shore" or southern Maryland. The eastern shore is low and level; only in the north does it reach 100 feet, and most of it is less than 25 feet above the sea. The western shore is higher and rises to 300 feet near the District of Columbia and again near Baltimore. Chesapeake Bay has many islands, and the entire Atlantic coast is made up of a long, reeflike, sandy island, inclosing the Chincoteague and Assateague bays. The eastern shore is drained by the Pocomoke, Nanticoke, Choptank, and Chester rivers and by some smaller streams. The western shore is drained in the most part by the Potomac, the Patuxent, the Patapsco, and the Gunpowder.

The most conspicuous feature of the coastal plain of Maryland is Chesapeake Bay, which has about two-thirds of its 200 miles of length within the State. It is from 10 to 40 miles wide, and its numerous estuaries cut the plain in every direction and reach to the eastern edge of the piedmont plateau. The bay is navigable for the largest ships, and its numerous arms furnish a large number of fine harbors. The large area of sheltered, shallow, inland water affords an excellent fishing ground and an opportunity for oyster gathering and oyster culture scarcely equaled elsewhere in the world.

The piedmont plateau extends from the edge of the Atlantic plain to the Catoctin Mountain, the first range of the Appalachian system. This region is about 40 miles wide. Most of the surface is broken and hilly, especially in its western part, ascending with complicated drainage systems to Parr's Ridge in Carroll County. Between Parr's Ridge and the Catoctin Mountain is the comparatively level Frederick valley, drained by the Monocacy River, flowing southward into the Potomac. Near the mouth of the Monocacy, Sugar Loaf Mountain (1281 feet) rises abruptly from the plain. From the Catoctin Mountain to the west boundary of the State, the Appalachian region spreads a succession of valleys, separated by nearly parallel northeast and southwest mountain ranges and all draining into the Potomac. The Blue Ridge, 2400 feet high at Quirauk, near the Pennsylvania line, crosses the State to Weverton on the Potomac and is the eastern limit of the Great or Hagerstown valley. This valley is bounded on the west by the North Mountain, between which and Cumberland is the Alleghany Ridge, a complex chain of long, narrow, very level mountain ridges, separated by narrow valleys, beginning at an elevation of about 500 feet at the Potomac. Just west of Cumberland rises Dan's Mountain (2882 feet).

To the west of it is the Alleghany plateau, giving the elevation of 2000 feet or more to all of Maryland to the west, except the immediate valleys of the Potomac, Savage, and Youghiogheny rivers.

Much of the plateau is above 2500 feet, and the highest mountains, the Savage and its extension, the Backbone Mountain, exceed 3000 feet in elevation.

Climate. The climate of Maryland is one of transition in which the Northern severe winter gives way to the open Southern winter. The extreme temperatures of more Northern locations are occasionally met with, but the periods of cold are of less duration and the number of freezing days and the amount of snowfall are less. An extreme winter temperature of 26° below zero F. has been recorded at Sunnyside in the Alleghany plateau, and a summer temperature of 109° F. near Cumberland. Changes of temperature are frequent, and there is a great daily range. In north-central Maryland the average temperature for January is 30° F., that for July 75° F. The average annual temperature for the State is between 53° F. and 54° F. The average dates for first and last killing frosts in the plateau are October 1 and April 15; on the Marine Islands the growing season is a month longer, extending from April 1 to October 15.

The average rainfall for the State is 43 inches, of which 11.5 to 12 fall in spring and in summer and 9.5 to 10 in the fall and in winter. The effects of elevation and slope are clearly shown in the distribution of the rainfall. The western slope of the Alleghany plateau receives 53 inches; the eastern slope of Parr's Ridge over 45; the inclosed valleys between Cumberland and Hagerstown and small sections at the extreme east and southwest of the State, receive between 30 and 35. The Atlantic plain in the main receives from 42 to 48 inches. The snowfall averages 25.4 inches for the State, 16.6 for the southern and 43.4 for the western districts. The number of days of precipitation on the coast is 130, in the mountains 140. The relative humidity varies from 80 in the sea islands to 65 at the extreme west. The warm moist climate and light soil of the eastern shore cause that district to be the home of many Southern plants not found elsewhere in the same latitude.

Soil. Maryland has varied soils corresponding with the geological formations. The more recent formations of the Atlantic plain have light, sandy, and loamy soils, unsuited to grass, but especially adapted to vegetables, truck farming, small fruits, and peaches. Southern Mary-

land is an extensive producer of tobacco for the export trade. The region of metamorphic rocks and the limestone and shale valleys of the west are of heavier, often clay, soils, usually very fertile and adapted to wheat, maize, grass, and clover. On the western slope of the Blue Ridge Mountains, the Cambrian (Harper's) shale, crossing the State from Harper's Ferry northeastward, produces a strip of sandy, shaly soil with exceptional adaptation to peaches, which are here a highly specialized crop. Similar shaly soils are on the flanks of all the ranges, and the valley floors are usually limestone.

Geology. Maryland presents a great variety of geologic formations, owing to the fact that it presents what is virtually a cross section from the Ohio valley to the Atlantic Ocean. That is, the various outcrops which run in broad bands parallel with the Atlantic coast are here so narrow that the whole series is encompassed by the State, from the coastal-plain formations to the western coal fields, while farther south they widen out so that even the State of North Carolina does not include them all. The entire portion of the State east of Chesapeake Bay and a strip from 5 to 20 miles wide along its west shore are covered with relatively recent and for the most part unindurated formations, consisting of Tertiary and Quaternary sands and clays east of the bay, and Cretaceous, Eocene, and Miocene on the west shore. West of this follows the Archean belt of the piedmont plateau. It is here about 50 miles broad, occupying the whole central part of the State, but in early Mesozoic time this Archean land was divided into two parts by a narrow arm of the sea which ran southwestward from the present mouth of the Hudson, and whose bed is now filled with a deep layer of Triassic sandstones and shales and accompanying dikes of diabase occupying the Frederick valley. The narrow western part of the State is traversed by the various outcrops brought to the surface by the Appalachian folding and subsequent denudation. They are largely Devonian, which is of great thickness, but include also all of the older Paleozoic periods—Cambrian, Ordovician, and Silurian. From the vicinity of Cumberland to the west boundary of the State the various formations of the Carboniferous and Permian are exposed, forming a part of the great Appalachian coal field. The Maryland coals occur in five basins, of which the Georges Creek and upper Potomac basins are most largely worked. In addition to the foregoing there are intrusions of eruptive rocks running in a chain of dikes east of the Blue Ridge. During the Pliocene and Pleistocene periods the eastern part of the State was subjected to repeated changes of level, resulting in a series of four sea-formed terraces, the oldest lying at the highest level and the successively younger imbricating around the preceding. The latest has been but slightly dissected by erosion, whose effects are more pronounced on the older and higher terraces. The latest movement of the land was downward, resulting in a partial submergence of the lower courses of the coastal-plain rivers—Chesapeake Bay and its broad and winding estuaries being, in fact, a drowned river valley with its tributary streams converted into estuaries.

Mining. The principal mineral product is coal, which represents over one-half of the total mineral value produced. Deposits are confined to Allegany and Garrett counties, with the greater part coming from the Georges Creek basin in the former. Coal mining was started in the early part of the nineteenth century, the product being shipped by barges on the Potomac River. The coal of the Georges Creek basin is of high repute as a steam and blacksmith's fuel, but has poor coking qualities. The output in 1913 was 4,779,839 short tons, valued at $5,927,046. Mechanical methods of mining coal have made little progress in Maryland mines, as practically 95 per cent of the total production is mined by hand. In 1912 there were 6162 men employed in the coal mines.

Next to coal, the most important industries are clay working and stone quarrying. The clays are widely distributed and are suitable for a variety of uses. The fire bricks manufactured from that of the western part are considered among the best in the United States. The value of the clay products in 1913 was $1,917,500. The principal quarry product is granite. A white marble extensively used for structural purposes is also produced in Baltimore County. Limestone is quarried in considerable quantities in the western part of the State. Maryland is one of the most important slate-producing States. Slate is all quarried in the so-called Peach Bottom district near Cardiff, Harford County. The product is a black slate well known in the markets all over the world and is used almost entirely for roofing. Lime is produced in considerable quantities. The product in 1913 was 108,883 short tons, valued at $357,392. The value of the sand and gravel produced in 1913 was $622,567. The other commercial mineral products are cement, copper, feldspar, infusorial earth, iron ore, mineral paints, mineral waters, quartz, sand-lime brick, talc, soapstone, and a small quantity of silver. The total value of the mineral products in 1913 was $11,292,723.

Agriculture. Of an approximate land area in 1910 of 6,362,240 acres, 5,057,140 were in farms, of which there were 48,923. The improved land in farms in 1910 was 3,354,767 acres. The average acres per farm was 103.4 in 1910. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was $286,167,028 in 1910. The average value of land per acre was $32.32 in 1910. Of the total number of all farms in 1910, 14,416 were operated by tenants. The acreage of farms owned by white farmers in 1910 was 2,783,279; that owned by colored farmers was 122,039. The acreage leased by white farmers was 1,721,414; that leased by colored farmers was 223,117. The native white farm operators in 1910 numbered 40,669, the foreign-born white farmers 1882, and the negro and other nonwhite farmers 6372.

The following is a table of crops, showing acreage, value, and production as estimated by the United States Department of Agriculture.

PRODUCTS	Acreage	Prod. bu.	Value
Corn	663,000	24,531,000	$16,681,000
Wheat	612,000	13,158,000	13,947,000
Oats	43,000	1,161,000	604,000
Potatoes	44,000	3,432,000	2,059,000
Hay	390,000	*448,000	6,854,000
Tobacco	*22,000	†17,600	1,408,000
Rye	25,000	425,000	366,000

* Tons. † Pounds.

The total value of crops in 1909 was $43,920,000. The general character of agriculture is indicated by the fact that about half of the total value of the crops in 1909 was contributed by cereals, about one-sixth by potatoes and other vegetables, and more than one-eighth by hay and forage. The remainder consisted chiefly of forest products, fruits and nuts, tobacco, small fruits, and flowers, plants, and nursery products. The leading crops in the order of their importance are corn, wheat, hay and forage, potatoes, and tobacco.

The total acreage of potatoes and other vegetables in 1909 was 155,339 and their value $7,996,105. Excluding potatoes and sweet potatoes and yams, the acreage of vegetables was 108,084 and their value $5,729,000. The growing and canning of orchard fruits is of importance. The total production of the orchard fruits in 1909 was 2,577,359 bushels, valued at $1,517,400. Of these, apples were by far the most important. Other important orchard fruits were peaches and nectarines, pears, cherries, plums, and prunes. Figs are the only tropical fruit grown in any quantity. Of small fruits the most important is the strawberry, of which 23,611,095 quarts, valued at $1,070,072, were grown in 1909. The total production of small fruits in that year was 26,277,054 quarts, valued at $1,227,548.

A small amount of sugar beets are grown, and these are used entirely as root forage. There were grown, in 1909, 275 tons of sorghum cane, from which 1782 gallons of sirup were made.

Live Stock and Dairy Products. The total value of the domestic animals of the State in 1909 was $30,649,961. On Jan. 1, 1915, the estimated numbers and value of live stock were as follows: cattle, other than milch cows, 121,000, valued at $3,570,000; milch cows, 177,000, valued at $9,558,000; horses, 167,000, valued at $18,871,000; mules, 25,000, valued at $3,450,000; sheep, 223,000, valued at $1,160,000; swine, 349,000, valued at $3,385,000. The poultry of all kinds on the farms in 1910 were valued at $1,858,570. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $5,480,900. This included 8,739,720 pounds of butter. There were 19,424,325 gallons of milk sold.

Fisheries. In 1890 the value of the fishery products was $6,460,759, while in 1908, the latest year for which complete statistics are available, it had fallen to $3,306,910. More persons are engaged in the industry than in any other State. The oyster is the most important product of the fisheries, amounting to almost 75 per cent of the entire output. In 1908, 5,830,200 bushels of oysters, valued at $2,127,140, were taken for market purposes and 401,800 bushels, valued at $101,190, for seeding purposes. The rivers flowing into Chesapeake Bay contribute largely to the fisheries products, particularly shad. There were taken, in 1908, 3,936,800 pounds of this fish, with a value of $246,590. Soft crabs were taken to the amount of 7,587,300 pounds, valued at $195,000, and hard crabs to the amount of 12,785,900 pounds, valued at $124,350. Among other important products are alewives, striped bass, menhaden, white perch, yellow perch, sturgeon, catfish, and terrapin. There were engaged in the fisheries, in 1908, 8444 fishermen. There were 1107 vessels engaged in fishing, and these were valued at $821,141.

Manufactures. Maryland has been an important manufacturing State from its first settlement. The value of its products per capita increased from $57 in 1849 to $244 in 1909, when it ranked fifteenth among the States, when measured by the value of its products. The table on the following page gives the more important figures relative to the 10 leading industries, as gauged by value of products, for 1909 and 1904.

As will be noted from the table, the manufacture of clothing is by far the most important industry. In 1909 Maryland ranked fourth among the States in the production of men's clothing and eighth in the production of women's clothing. The canning and preserving of fruits, vegetables, fish, and oysters and the manufacture of pickles, preserves, and sauces is an important industry. This industry, whose chief characteristic is its extremely seasonal character, attained commercial recognition in 1850, and Maryland became its chief centre. Considering the short season during which it is active, the value of its products, compared with other industries, is very large. The total value of vegetables canned in 1909 was $10,779,540. The lumber and timber industry has more establishments than any other. The making of fertilizers is also of great importance. This industry began about 1832, when the demand for a commercial fertilizer arose on account of the increase in tobacco culture and various other forms of agriculture. Bone was the first crushed fertilizer, but subsequently crushed bone was mixed with phosphate rock from South Carolina, guano from the West Indies, and potash salts from Germany. The quantity of all kinds of fertilizers produced in 1909 was 608,699 tons. The manufacture of cotton goods, including cotton small wares, is one of the oldest industries. In 1909 there were 16 establishments, the value of whose products was $5,522,000. The manufacture of iron and steel products, chiefly pig iron, is of considerable importance, although on the decline. There are iron deposits, but the ore is of a grade that does not compare favorably with other ore, and most of it is imported. There were produced, in 1912, 219,546 long tons of pig iron. In the early history of the State shipbuilding was one of its most important industries. The "Baltimore clippers" were famous all over the world and were instrumental in greatly extending the commerce of the State. The substitution of iron and steel for wood in shipbuilding resulted in the decline of the industry. It is still of considerable importance, however, and many vessels for the United States government are constructed in the shipyards of the State. There were launched, in 1909, 129 vessels of all kinds, with a gross tonnage of 34,160. Of these, nine were iron and steel vessels.

The average number of wage earners engaged in the manufacturing industries in 1909 was 107,921; 75,573 were males and 32,348 were females. The wage earners under 16 years of age numbered 6548, of whom 3157 were males. Almost three-fourths of the total number of wage earners in 1909 were in establishments where the prevailing hours of labor per week ranged from 54 to 60, or from 9 to 10 a day, and of these over one-half were employed 60 hours a week. By far the most important city is Baltimore. There were in this city, in 1909, 71,444 wage earners, and the value of the product of its

manufactures was $186,977,710. In the value of manufactured products Baltimore was thirteenth among the cities of the United States in 1909. The men's clothing industry is practically confined to Baltimore.

Forest Products. Although much of the merchantable timber has been cut away, there are still large quantities of timber standing. The use of the lumber for the manufacture of paper and pulp has shown a large increase in recent years. In 1909 there were cut 267,939 M feet of rough lumber and there were manufactured 17,583 thousands of lath and 12,352 thousands of shingles. The principal varieties of lumber sawed in 1910 were yellow pine, oak, and chestnut. There were also forest products to the value of $2,349,045 cut or produced on the farms. This includes firewood, charcoal, fencing material, logs, railroad ties, telegraph and telephone poles, materials for barrels, tanbark, etc.

Transportation. Maryland is traversed by the main lines of two important railroad systems. The Baltimore and Ohio Railroad was one of the first important lines operating in the United States. The total railway mileage on June 30, 1914, was 1401 miles of single-track road. The Baltimore and Ohio, with 336 miles, had the longest mileage; the Philadelphia, Baltimore, and Washington had 329; the Western Maryland 272; the Baltimore, Chesapeake, and Atlantic 88; and the Northern Central 77. The Baltimore and Chesapeake Canal connects the head of Chesapeake Bay with the Delaware River. Chesapeake Bay gives excellent facilities for water transportation, and the Potomac River is navigable to Washington. The Chesapeake and Ohio Canal, in the early part of the nineteenth century a great highway of commerce, now carries chiefly coal. Baltimore is the commercial centre of the State. There were, in 1914, 18 companies operating electric railways, and these had 940 miles of single track in the State.

Banking. The first bank in the State was the Bank of Maryland, chartered in 1790. In the early thirties there were half a dozen banks in Baltimore which suffered with all the other banks of the country from the money panic of 1837. Six or seven banks failed, among them the Bank of Maryland, seriously affecting the commercial interests of the State. In 1850 there were 27 banks, with a capital of $9,310,407. On Sept. 12, 1914, there were 101 national banks, with capital $16,009,710, surplus $11,761,710, cash $5,091,791, loans $95,354,675, and deposits $91,912,716. There were on June 30, 1914, 62 State banks with capital $2,997,945, surplus $1,673,455, cash $1,017,106, loans and discounts $20,006,159, and deposits $24,945,808; and 52 savings banks (mutual and stock) with 289,585 depositors and deposits to the amount of $109,663,347.

Government. The State has been governed under constitutions of 1776, 1851, 1864, and 1867. Amendments may be proposed by the General Assembly and must be passed by three-fifths of all the members of the two Houses. The amendment is then submitted to the qualified voters. When two or more amendments are submitted, they shall be so submitted that each

COMPARATIVE SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	Persons engaged in industry: Total	Persons engaged in industry: Wage earners (average number)	Capital	Wages	Value of products	Value added by manufacture
					Expressed in thousands			
All industries	1909	4,837	125,489	107,921	$251,227	$45,436	$315,669	$116,620
	1904	3,852	107,303	94,174	201,878	36,144	243,376	93,352
Canning and preserving	1909	468	9,755	8,613	8,377	1,926	13,709	3,619
	1904	408	10,167	9,146	7,151	1,790	12,935	3,762
Cars and general shop construction and repairs by steam-railroad companies.	1909	21	5,926	5,549	4,264	3,535	9,059	3,866
	1904	21	5,203	4,977	2,303	2,837	5,752	3,142
Clothing, men's, including shirts	1909	359	21,946	19,784	19,578	7,563	36,921	15,955
	1904	157	15,274	13,849	12,766	4,110	25,653	10,881
Copper, tin, and sheet-iron products	1909	81	5,980	5,275	24,719	2,076	16,909	6,101
	1904	75	3,054	2,727	16,455	987	9,263	3,167
Fertilizers	1909	41	1,750	1,439	9,098	617	9,673	2,710
	1904	39	1,500	1,256	6,058	524	6,632	1,640
Flour-mill and gristmill products	1909	295	935	506	3,729	227	9,268	1,265
	1904	202	890	550	2,717	212	7,318	1,108
Foundry and machine-shop products	1909	157	5,520	4,798	10,324	2,751	11,978	6,022
	1904	118	5,451	4,899	8,274	2,810	10,586	6,640
Lumber and timber products	1909	561	8,165	7,003	9,182	2,457	12,134	5,627
	1904	301	5,851	5,149	5,432	1,959	8,937	4,031
Slaughtering and meat packing	1909	54	1,324	1,034	3,808	604	13,683	2,180
	1904	44	683	562	1,322	320	6,848	960
Tobacco manufactures	1909	263	4,098	3,476	6,644	1,229	10,559	4,893
	1904	...	.....	.....	.....	.....	.....	.....

amendment shall be voted on separately. Every 20 years dating from 1887 the question of calling a constitutional convention for altering the constitution is laid before the people.

Legislative.—The Legislature consists of two branches, a Senate and a House of Delegates. Each county and each of the four legislative districts of Baltimore City is entitled to one Senator, who serves for four years. Each county is entitled to delegates in proportion to its population, ranging proportionately from two delegates for every county having 18,000 inhabitants or less to six delegates for each county having 55,000 or more. Each of the four legislative districts of Baltimore is entitled to the number of delegates to which the largest county is entitled. An unusual provision of the constitution prevents clergymen of any creed or denomination from serving as Senator or delegate. The General Assembly meets every second year on the first Wednesday of January, dating from 1868. Sessions are limited to 90 days. When the General Assembly is convened by proclamation of the Governor, the session shall not continue longer than 30 days. The House of Delegates has the sole power of impeachment, and all impeachments are tried by the Senate.

Executive.—The executive power is vested in the Governor, who holds office for four years. He must have attained the age of 30 years, have been a citizen of the State for 10 years, and for five years next preceding his election a resident of the State. The Governor has the veto power, but bills carrying his veto may be passed by a three-fifths majority of the members of both Houses. The Governor has power to disapprove of any item or items of any bills making appropriations of money embracing distinct items.

Judiciary.—The judicial power is vested in a court of appeals, circuit courts, orphans' courts, and justices of the peace. The judges of all courts are elected in the counties by the qualified voters in their respective judicial circuits. Each of the judges holds office for a term of 15 years or until he shall have attained the age of 70 years. The court of appeals is composed of the chief judges of the first seven of the several judicial circuits and a judge from the city of Baltimore specially elected thereto. One of these is appointed chief judge by the Governor. The State is divided into eight judicial circuits, the city of Baltimore constituting the eighth. For each of these circuits there is a chief judge and two associate judges, styled Judges of the Circuit Court. In the city of Baltimore are six courts: the Supreme Bench of Baltimore City, the Superior Court of Baltimore City, the Court of Common Pleas, the Baltimore City Court, the Circuit Court of Baltimore City, and the Criminal Court of Baltimore. The orphans' courts are composed of three men for each county, elected for a term of four years.

Suffrage and Elections.—Every male citizen of the United States of the age of 21 years and upwards, who has been a resident of the State for one year and of the legislative district or county in which he may offer to vote for six months next preceding the election, is entitled to vote. Persons convicted of bribery or other crimes against the electorate are forever disqualified from voting thereafter. Elections for Governor are held on the Tuesday next after the first Monday of November every four years, dating from 1867. There is a primary-election law, which was enacted in 1912. All parties must nominate candidates, including judges and members of the national House of Representatives, by primary elections. The nomination of candidates by direct vote does not apply to the nomination of such candidates for county offices, State Senate, and members of the House of Delegates in the counties of Howard, Washington, and Worcester. Provision is also made by the act for presidential primaries.

All candidates for offices must be nominated, selected, or chosen by the direct vote of the duly registered voters belonging to the political parties. In case there are more than two candidates for any State office, there is provided on the ballot opportunity for voters to indicate first or second choice respectively. There is a corrupt-practices act, which compels a strict accounting for political funds and limits the expenditures. By provisions of this act candidates' expenditures are limited to $10 per thousand registered voters up to 50,000 and $5 per thousand above 50,000. An unusual provision is that any promise made by the wife of a candidate is to be considered as coming from the candidate himself. United States Senators are nominated under a special senatorial primary-election law enacted in 1908. The Legislature of 1914 amended this law so as to conform with the provisions of the Seventeenth Amendment to the Constitution.

Local and Municipal Government.—The General Assembly has power to organize new counties, but no such county must be formed without the consent of the majority of the legal voters residing within the limits proposed to be formed into the new county; and no new county must contain less than 400 square miles or less than 10,000 white inhabitants, nor must any change be made within the limits of any county whereby the population of said county would be reduced to less than 10,000 white inhabitants or its territory be reduced to less than 400 square miles. Each county has a county commissioner elected for a term not exceeding six years. A sheriff and a surveyor are also elected for each county. Other county officials are coroners, elisors, and notaries public. Towns and cities may adopt a commission form of government. The only city which had adopted this form at the end of 1913 was Cumberland.

Other Constitutional and Statutory Provisions.—A married woman may acquire, hold, and manage property independently of her husband and dispose of the same as if single. The husband must join, however, in the execution of any deed. Debtors are protected in the possession of property to the value of $500. Professional Christian Science healers come within the statutory regulations concerning practitioners of medicine. The white-slave traffic is regulated by severe provisions. There is a workmen's compensation law and provisions regulating the employment of children. The State has no general local-option law, but a number of countries have been permitted to vote on the liquor question by virtue of special acts passed by the Legislature. A bill extending local option in regard to the sale of intoxicating liquor to counties not prohibiting such sale was passed by the House of Delegates in 1912, but was defeated by the Senate.

Finance. Maryland led in the movement for internal improvements which began in the early twenties of the nineteenth century, and its first public debt was created in order to acquire 5000

shares of the Chesapeake and Ohio Canal. In 1836 bonds to the amount of $8,000,000 were authorized to be invested in various improvements, chiefly canals and the Baltimore and Ohio Railroad, and by 1839 the public debt amounted to more than $16,000,000. A financial collapse resulted in the following year when the State stopped payments of interest. In 1841 very heavy taxes were imposed, which were almost impossible to collect, and a repudiation of the State's debts was threatened. The arrears of interest were finally funded in 1844, and on Jan. 1, 1848, payment of interest on the State debt was resumed. During the Civil War there was a considerable debt incurred for defense, bounties, etc., but it has been defrayed, and the debt now consists almost entirely of bonds sold to defray the cost of new public buildings. On Sept. 30, 1914, the bonded debt amounted to $19,685,880. Of these bonds the largest issue, amounting to $3,191,095, is a refunding series known as the consolidated loan of 1899. All the remaining bonds were issued at different times between 1900 and 1914 either for public buildings or for public roads and highways. In 1914 there was raised a loan of $817,880 for the purpose of refunding the consolidated loan of 1899, due Jan. 1, 1914. The sinking fund of this loan held securities and cash aggregating $3,209,230, or more than sufficient to retire it; but rather than sell the securities at a loss the Treasury officials decided to hold the securities and refund for the amount less the holdings of its own stocks. On Sept. 30, 1914, there was a balance in the Treasury of $1,840,256. The gross receipts for the fiscal year 1914 amounted to $12,600,566. The disbursements aggregated $12,999,561. The State has no floating debt.

Militia. According to the Thirteenth Census there were 271,373 men of militia age. The organized militia on June 31, 1914, consisted of 157 officers and 1986 enlisted men.

Population. The growth of the population is shown by the following figures: 1790, 319,728; 1850, 583,034; 1870, 780,894; 1900, 1,188,044; 1910, 1,295,346. Population on July 1, 1914, was 1,341,075; 1920, 1,449,661. By color the population in 1910 numbered 1,062,639 whites and 232,250 negroes. There is a small foreign population. The native whites of foreign or mixed parentage in 1910 numbered 191,838 and the foreign-born whites 104,174. Of the latter the largest numbers came from Germany and Russia. The urban population, i.e., in places of 2500 or more, in 1910 was 658,192. The rural population in 1910 numbered 637,154. The density per square mile in 1910 was 130.3. By sex the population was divided in 1909 into 644,225 males and 651,121 females. The males of voting age numbered 367,908. The largest city in the State is Baltimore (q.v.), with a population in 1910 of 558,485. The other large cities of the State, with their populations in 1910, are as follows: Cumberland, 21,839; Hagerstown, 16,507; Frederick, 10,411; Annapolis, 8609.

Education. Maryland has the same problems which hamper the development of education in the more Southern States. These include a negro and a preponderant rural population. Conditions have greatly improved as a result of wise measures passed by the Legislature and the intelligent supervision by the State Department of Education. In 1910, of a total population of 10 years of age and over of 1,023,950, there were 73,397 illiterates, or 7.2 per cent of the population. That conditions are improving is shown by the fact that the percentage in 1900 was 11.1 per cent. According to the Thirteenth Census the total number of children from 5 to 20 years of age in the State in 1910 was 415,905. Of these, 230,123 attended school. The report of the State Superintendent of Education shows a total population between 5 and 20 years, on July 31, 1913, of 415,908. The number of different pupils enrolled in 1913 was 237,835, and the average daily attendance was 115,007. In the colored schools there were, in 1913, 43,757, and the average daily attendance was 26,167. The total number of schools in 1913 was 2469, and there were 5805 teachers, of whom 4899 were females and 906 were males. The average yearly salary of teachers was $537.59. The total value of school property in 1913 was $10,672,069. Schools for colored children numbered 540, with 905 teachers, of whom 667 were females and 238 were males.

The educational system is administered by a State Board of Education with a State Superintendent as its executive officer. The Legislature of 1902 passed a compulsory education bill, but this applied only to Baltimore City and Allegany County. The Legislature of 1912 passed a compulsory school law, the adoption and enforcement of which is left to the school boards of the several counties, excepting five counties, whose representatives in the General Assembly had exempted their counties. Up to 1914 five county school boards had approved the law and were enforcing its provisions, with the result that there had been an increase of from 10 to 15 per cent in school attendance. The General Assembly of 1910 passed a high-school law, which made possible excellent results along the lines of secondary education. Approved high schools of the first group, which must have an enrollment of not less than 80 students, four grade and two special teachers, receive an appropriation from the State of $2300. A second-group high school, which may have a three years' course, two grade and one special teacher, and whose enrollment must be not less than 35 students, receives a State appropriation of $1400.

The total expenditure for public schools in 1913 was $5,326,876. The Legislature of 1914 passed a number of unusually important laws relating to education. Among these were measures providing for the consolidation of schools and the establishment of a State university. There has been a teachers' pension law since 1902. The normal schools are the Maryland State Normal School at Baltimore, Frostburg State Normal School at Frostburg, and the Maryland Normal and Industrial School for Colored Students at Bowie. The institutions of higher education in the State include Johns Hopkins University (q.v.) at Baltimore, which offers a summer course for teachers, Western Maryland College at Westminster, Washington College at Chestertown, St. John's College at Annapolis, Maryland Agricultural College at College Park, and Blue Ridge College at New Windsor. These institutions all receive State aid. In addition there are Goucher College and Hood College in Baltimore, Woman's College at Frederick, and the Maryland College for Women at Lutherville. Under the auspices of the Roman Catholic church are Loyola College at Baltimore, Mount St. Joseph's College at Baltimore, Rock Hill College at Ellicott City, and Mount St. Mary's College at Emmitsburg. Morgan

College at Baltimore is a coeducational institution for colored students. The Jacob Tome Institute, an endowed secondary school, is at Port Deposit. The United States Naval Academy, a government institution to train young men to serve as officers in the United States navy, is located at Annapolis.

Charities and Corrections. Charities and corrections are in charge of the Board of State Aids and Charities. The correctional institutions include St. Mary's Industrial School at Baltimore, Industrial Home for Colored Girls at Melvale, the House of the Good Shepherd (colored) at Baltimore, Maryland School for Girls at Loch Raven, the House of Reformation for Colored Boys at Cheltenham, and the Maryland Industrial School for Girls at Baltimore. There are in addition many homes and asylums for children and adults, especially in Baltimore. There are 23 general hospitals, 7 hospitals for the insane, and 9 special hospitals. In addition there are a number of educational institutions which come under the jurisdiction of the board. These include 10 boarding schools for general educational purposes, St. Francis Xavier's School for the Deaf at Irvington, Maryland School for the Blind at Overlea, and Maryland School for the Deaf at Frederick. The total appropriations for the support of the State institutions in 1913 amounted to $1,136,118. The State Penitentiary is in Baltimore. The convicts are generally employed under contract, the majority being engaged in the manufacture of boots and shoes. The prisoners confined in jails do not as a rule have employment. About half the prisoners are negroes.

Religion. The Roman Catholic and Methodist churches far surpass all others in Church communicants. Of the other denominations the strongest are the Protestant Episcopal, Lutheran, Baptist, and Presbyterian.

History. In 1632 Cecilius Calvert, second Lord Baltimore, received from Charles I a charter conferring on him the possession of the territory now forming the States of Maryland and Delaware. The grant had been obtained by George Calvert, first Lord Baltimore, the father of Cecil, but he died before the charter was issued. It was the intention of the Lord Proprietor to found a feudal State in Maryland (named in honor of Charles's Queen, Henrietta Maria), and to that end he was invested with sovereign powers, subject only to the recognition of the King as lord paramount by the payment of a yearly tribute of two Indian arrows. One of the chief causes that led to the settlement of Maryland was the desire of Lord Baltimore, a Catholic, to found a colony where his fellow believers might profess their religion openly without incurring the penalties to which they were subjected in England. Other denominations, however, in the Proprietor's scheme, were to be on an equal footing with the Catholics, and of the 20 gentlemen and 200 or 300 commoners who arrived at Point Comfort, Va., in February, 1634, under the leadership of Leonard Calvert, it is probable that more than half were Protestants. On the twenty-fifth of March mass was celebrated on St. Clement's Island in the Potomac, and shortly after the site of the city of St. Mary's was traced on land bought from the Yaocomico Indians, near the banks of the river.

In his use of the vast powers granted him by the King, Baltimore was as moderate as in the expression of his religious views, and he made no attempt to establish anything like an absolute government. By the terms of the charter, laws for the province could be made by the Proprietor only, with the consent of the freemen or their deputies, and on Jan. 26, 1635, the first assembly of freemen met at St. Mary's. The right of initiating laws, claimed both by the Assembly and by the Proprietor, was conceded in 1638 to the people, Baltimore reserving to himself the mere veto power. The first "statutes of the province" were passed in 1638 and 1639. With the Indians friendly relations were established. The worst enemy of Lord Baltimore's colony was William Claiborne (q.v.), a Virginian, who had established a trading post on Kent Island in Chesapeake Bay in 1631. He refused to recognize the authority of Lord Baltimore, and in 1638 his settlement was captured by Leonard Calvert during Claiborne's absence in England. In 1643 a company of Puritans, excluded from Virginia for nonconformity, settled at Providence, now Annapolis, and put themselves in opposition to the government. The outbreak of the Civil War in England enabled Baltimore's enemies to carry their opposition to a great length. In 1645 Capt. Richard Ingle, acting ostensibly in the name of Parliament, seized St. Mary's. Claiborne also returned from England, regained possession of Kent Island, and the Governor attempted in vain to dispossess him. For nearly two years Ingle held the province under his sway until Gov. Leonard Calvert returned from Virginia with a military force and recovered possession. As early as 1638 the molestation of Protestants had been punished. In 1649 an Act was passed at the desire of the Proprietor guaranteeing freedom of worship to all followers of Jesus Christ. The Puritans continuing to be turbulent, their settlement, by way of conciliation, was in 1650 erected into a separate county, named Anne Arundel, and as other Puritans arrived from England, Charles County was shortly afterward organized for their benefit. Their numbers increased to such an extent that they soon had a majority in the Assembly. In 1652 commissioners from England visited Maryland, among whom were Claiborne and Bennett, the Puritan leader of Anne Arundel County. The authority of the English Commonwealth was completely established in the colony, and Kent Island was given up to Claiborne. A commission for the government of the colony was organized with Capt. William Fuller at its head. The Puritans made use of their ascendancy to repeal the Toleration Act of 1649 and to enact penal laws against the Catholics. A severe conflict ensued. Providence was attacked March 25, 1655, by the proprietary party; but the assault was repulsed, the whole invading force being either killed or taken prisoners. In 1654 Lord Baltimore made a vain attempt to regain possession of the province, but succeeded only in defeating a scheme for uniting Maryland to Virginia. Three years later his title was recognized by the Protector, and in 1658 the proprietary government was restored. The period before the revolution of 1688 was marked by an important treaty with the Susquehanna Indians (1661) and some difficulties with William Penn concerning the boundary line between the two provinces in the Delaware country. Upon the deposition of James II, the incompetency of the Governor, the failure to proclaim the new monarchs, and preposterous rumors of a Popish plot stirred up the people, and an As-

sociation of the Protestant Freemen headed by Capt. John Coode seized the province in the name of William and Mary. The Legislature laid before the King a list of complaints against the government of Lord Baltimore, and in August, 1691, the Proprietor was deprived of his political privileges, though his property rights were left intact. In 1715, however, the province was restored to the fifth Lord Baltimore, a Protestant. At the beginning of the eighteenth century tobacco was the staple product. Commerce and manufactures were greatly restricted by the Navigation Acts. There were very few towns, Baltimore being founded as late as 1729, Frederick in 1745, and Georgetown in 1751. Prosperity was widely diffused, and the standard of living, owing to the abundance of game and fish, high. All sects were tolerated, except the Catholics, who were denied the suffrage and forbidden to worship in public. The Anglican church was established in 1692. Four years later a free high school was opened at Annapolis. The question of the north boundary, which after 1730 threatened to bring on war with Pennsylvania, was settled by the drawing of the famous Mason and Dixon's line (1763–67).

Maryland took an active part in the wars resulting in the extinction of the French domination upon the continent, and in the last and most important of these its western border suffered severely from Indian attacks, owing to the obstinacy of the Legislature in refusing to vote means for defense. The colony was also among the first to oppose the aggressions of the British government, which led to the War of the Revolution. The Stamp Act was received with great indignation, and the imposition of duties on tea was responded to by the burning of a tea ship (1774). In the same year a popular convention began to direct the revolutionary movement. It gradually assumed charge of the government. A bill of rights and a constitution were adopted in November, 1776, and the Legislature assembled at Annapolis, Feb. 5, 1777. Maryland took a most efficient and honorable part in the Revolutionary War, though it did not join the Confederation till 1781, owing to her claim that the western lands should belong to the Union. In 1783 Congress met at Annapolis, and here, on December 23, after the conclusion of peace, Washington resigned his commission as general in chief. The Federal Constitution was adopted in the Maryland convention April 28, 1788, by a vote of 63 to 11. Maryland suffered considerably in the War of 1812. (See UNITED STATES.) The beginning of the war was marked by a fierce riot against a Federalist newspaper of Baltimore, in which a number of people were killed. Havre de Grace and other villages were burned by the English fleet in 1813, Baltimore was unsuccessfully attacked by a British army, and Fort McHenry was bombarded in September, 1814. This battle was the occasion for the writing of "The Star Spangled Banner" by Francis Scott Key (q.v.). An elaborate system of internal improvements was initiated in 1828, when the Chesapeake and Ohio Canal and the Baltimore and Ohio Railroad were begun. (See *Finance.*) In 1844 the first line of electric telegraph in the United States was run from Baltimore to Washington. The position of Maryland in the Civil War was peculiar. As a slaveholding State her sympathies were naturally to a great extent with the South, but her proximity to Pennsylvania made her truly a Border State. Many of her people favored secession, a large number entered the Confederate army, and in the first days of the war the passage of Union troops through Baltimore was opposed, several Massachusetts soldiers being killed on April 19, 1861; but the strength of the Union party, added to the efforts of the Governor, served to keep the State from seceding. Later, bitter feelings were aroused by the policy of the general government in establishing military rule and suspending the habeas corpus in a large part of the State. The adherence of Maryland to the Union was extremely important in that it saved Washington from falling into the power of the Confederates.

Railroad development was facilitated by a system of State and county aid. For many years the claims of the State against the Baltimore and Ohio Railroad for the recovery of the subsidy granted the company in 1836 were fought in the courts without definite result. The Chesapeake and Ohio Canal was constructed as far as Cumberland and was profitable for some years, but diversion of traffic and danger from storms made it bankrupt. In 1865 the educational system, antiquated and inefficient, was reformed. The prevalence of corruption in city elections led to a revision of the election laws in 1889 and the adoption of the Australian ballot in 1890. In 1896 the bipartisan system of election boards was fully recognized.

The constitution of 1776 was often amended, especially in 1802, when the property qualification for the suffrage was abolished, and in 1837 the election of the Governor was given to the people. New constitutions were adopted in 1851, 1864, and 1867, the second of which abolished slavery. Its electoral vote has been as follows: 1796, Adams, 7, Jefferson 4; 1800, Adams 5, Jefferson 5; 1804, Pinckney 2, Jefferson 9; 1808, Pinckney 2, Madison 9; 1812, Clinton 5, Madison 6; 1816, Monroe 8; 1820, Monroe 11; 1824, Jackson 7, Adams 3, Crawford 1; 1828, Adams 6, Jackson 5; 1832, Clay 5, Jackson 3. It went Whig from 1836 to 1848, Democratic in 1852, American party (Know-Nothing) in 1856, and Democratic in 1860. In 1864 it voted for Lincoln, but from 1868 to 1892 was Democratic. In 1896, 1900, 1904, and 1912 it went Republican.

In 1907 John Walter Smith, Democrat, was nominated for Senator by votes cast for the first time directly by the people. The primary was, however, limited to the Democratic party. In the election for State officers held in November of that year Austin L. Crothers, Democrat, was elected Governor.

The presidential election of 1908 resulted in a division of the electoral vote. Bryan received six and Taft two, although the highest Taft elector received 116,593 votes compared with 115,910 votes for the highest Bryan elector. This situation was brought about by the large number of ignorant voters who were unable to read the names on the ballots.

In 1909 and again in 1910 persistent efforts were made to disfranchise the negro vote; these failed largely through the efforts of Governor Crothers. Statutes passed by the State Legislature made the "grandfather clause" (see SUFFRAGE) applicable to individual cities. These greatly restricted the negro vote. In June, 1915, the United States Supreme Court declared these statutes unconstitutional. State officers were for the first time nominated at direct primaries in 1911.

The Legislature of 1912 passed a measure providing for primaries for the election of presidential electors. Although the Republican sentiment was strongly for Roosevelt, as appeared from these elections, the control of the party remained in the hands of the Republicans. Following the nomination of Mr. Taft in Chicago, the Progressives formed a separate party. At the election of Nov. 5, 1912, Wilson carried the State with 116,654 votes, Roosevelt received 57,786 and Taft 54,956.

Senator Isidor Rayner died in 1912, and the Governor appointed William P. Jackson to fill his place until an election could be held, which would have been in 1914. In the meantime, however, the constitutional amendment providing for the election of Senators by the people had been ratified by the States. Governor Crothers issued a warrant for the election of a Senator by the people in November, 1913, although the Legislature had passed no law providing for the machinery and method for nominating and electing Senators. The Democrats nominated Blair Lee, the Republicans Thomas Parran, and the Progressives George L. Wellington. Lee was elected by a large plurality. His right to a seat in the Senate was questioned, and a hearing was held by the Senate Committee on Privileges and Elections; he was declared entitled to his seat in January, 1914.

In 1913 six amendments to the State constitution were ratified. The most interesting of these was one empowering the Legislature to place the penalty for bribery at elections upon the buyer of votes as well as the seller.

The term of Senator Smith expired March 4, 1914, when he was a candidate for reëlection; he was opposed by E. S. Carrington, Jr., Republican, and V. C. Reichard, Progressive. At the election held in November, 1914, Mr. Smith was reëlected. The most remarkable feature of this election was the decline of the Progressive vote, which from 57,786 in 1912 fell to 3697 in 1914.

The following is a list of the Governors:

PROPRIETARY GOVERNORS

Leonard Calvert	1634–47
Thomas Greene	1647–49
William Stone	1649–54
Commissioners	1654–58
Josias Fendall	1658–60
Philip Calvert	1660–61
Charles Calvert (became Lord Baltimore 1675)	1661–76
Cecilius Calvert	1676
Thomas Notley	1676–79
Charles, third Lord Baltimore	1679–84
Benedict Leonard Calvert and Council	1684–88
William Joseph (President of Council)	1688–89
Protestant Associators	1689–90
Nehemiah Blakistone and Committee	1690–92

ROYAL GOVERNORS

Sir Lionel Copley	1692–93
Sir Edmund Andros	1693–94
Francis Nicholson	1694–99
Nathaniel Blakistone	1699–1702
Thomas Tench (President of Council)	1702–04
John Seymour	1704–09
Edward Lloyd (President of Council)	1709–14
John Hart	1714–15

PROPRIETARY GOVERNORS (RESTORED)

John Hart	1715–20
Charles Calvert	1720–27
Benedict Leonard Calvert	1727–31
Samuel Ogle	1731–32
Charles, fifth Lord Baltimore	1732–33
Samuel Ogle	1733–42
Thomas Bladen	1742–47
Samuel Ogle	1747–52
Benjamin Tasker	1752–53
Horatio Sharpe	1753–69
Robert Eden	1769–76
The Convention and Council of Safety	1776–77
Thomas Johnson	1777–79

STATE

Thomas Sim Lee		1779–82
William Paca		1782–85
William Smallwood		1785–88
John E. Howard		1788–91
George Plater		1791–92
Thomas Sim Lee		1792–94
John H. Stone		1794–97
John Henry	Democratic-Republican	1797–98
Benjamin Ogle	Federalist	1798–1801
John F. Mercer	Democratic-Republican	1801–03
Robert Bowie	" "	1803–06
Robert Wright	" "	1806–09
Edward Lloyd	" "	1809–11
Robert Bowie	" "	1811–12
Levin Winder	Federalist	1812–15
Charles Ridgely	"	1815–18
Charles Goldsborough	"	1818–19
Samuel Sprigg	Democratic-Republican	1819–22
Samuel Stevens, Jr.	" "	1822–25
Joseph Kent	" "	1825–28
Daniel Martin	Anti-Jackson	1828–29
Thomas K. Carroll	Jackson-Democrat	1829–30
Daniel Martin	Anti-Jackson	1830–31
George Howard	Whig	1831–33
James Thomas	"	1833–35
Thomas W. Veazey	"	1835–38
William Grayson	Democrat	1838–41
Francis Thomas	"	1841–44
Thomas G. Pratt	Whig	1844–47
Philip F. Thomas	Democrat	1847–50
Enoch L. Lowe	"	1850–53
Thomas W. Ligon	"	1852–58
Thomas H. Hicks	American	1858–62
August W. Bradford	Unionist	1862–65
Thomas Swan	Unionist, later Democrat	1865–68
Oden Bowie	Democrat	1868–72
William P. Whyte	"	1872–74
James B. Groome	"	1874–76
John L. Carroll	"	1876–80
William T. Hamilton	"	1880–84
Robert M. McLane	"	1884–85
Henry Lloyd	"	1885–88
Elihu E. Jackson	"	1888–92
Frank Brown	"	1892–96
Lloyd Lowndes	Republican	1896–1900
John W. Smith	Democrat	1900–04
Edwin Warfield	"	1904–08
Austin L. Crothers	"	1908–12
Phillips L. Goldsborough	Republican	1912–16
E. C. Harrington	Democrat	1916–20
A. C. Ritchie	"	1920–

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MARYLAND AGRICULTURAL COLLEGE. A State institution for agricultural and scientific education, founded at College Park, Md., in 1856. The college includes departments of agriculture, horticulture, biology, chemistry,

canning, mechanical engineering, civil engineering, electrical engineering and general science, as well as courses for training teachers in agriculture and a summer school for teachers of rural schools. During the winter short courses in agriculture are given. The original college buildings, which were completed in 1859, and the administration building, completed in 1904, were destroyed by fire on Nov. 29, 1912. A temporary assembly hall, kitchen, and dining hall were erected. Calvert Hall, the dormitory, was completed in 1915. Other buildings are the library and gymnasium, buildings for the departments of civil and electrical engineering and physics, and Morrill Hall, containing the other important departments. The college sanitarium, completed in 1901, is used as an administration building. In 1914–15 there were about 500 students in all departments; of these 300 were in the regular courses and about 200 in the short courses. The faculty, including professors and instructors, numbered 40. The college has no endowment, the income depending upon annual appropriations made by the United States and the State of Maryland. The total annual income is about $165,000 and the buildings and grounds were valued at about $515,000. The library contains about 8000 volumes. The president in 1915 was Harry J. Patterson, D.Sc.

MARYLAND HISTORICAL SOCIETY. An association founded in 1844 for the purpose of collecting and arranging material relating to the history of Maryland. It now owns the Athenæum Building, on Saratoga Street, Baltimore, in which it has gathered a priceless collection of manuscripts, documentary records, books, and pamphlets. There is also a gallery of historic curios, portraits, and valuable paintings. The society has done great service in rescuing, editing, and printing historical data. It is the official custodian of the early archives of the State, and it is engaged in printing the most valuable of these records. Thirty large quarto volumes have already been issued. Its series of Fund Publications contains many valuable reprints and monographs.

MARYLAND YELLOWTHROAT. A North American warbler (*Geothlypis trichas*), common in summer throughout the continent. It is about 5½ inches long, olive green above and bright yellow below, with a conspicuous broad black band or "mask" across the forehead (of the male), which includes the bill, extends back to

MARYLAND YELLOWTHROAT.

a point on each side of the neck, and is bordered above by a white line; the female has only a dull white line above the eye. These warblers spend their time near the ground and make their nests there, usually beside a stream; and they utter a short, questioning song as characteristic as it is pretty. The name is rather misleading, as the species has been divided into five forms, the Maryland, Western, Florida, Pacific, and Salt Marsh yellowthroats. Four closely allied species, the Kentucky warbler (q.v.), mourning, Connecticut, and McGillivray's warblers, were formerly placed in this genus but now are grouped as *Oporornis*. All of these visit the United States, while several others are found only in Mexico and Central America.

MARYLEBONE, mă′rĭ-lē-bōn′, *commonly* mă′rĭl-bŏn *or* măr′ĭ-bŭn. A metropolitan and parliamentary borough in the northwestern part of the city of London. It is regularly laid out, with many handsome streets, and here are situated Regent's Park, the gardens of the Zoölogical and Botanic societies, the Coliseum, Middlesex and other hospitals, Bedford College for women, University College, several other denominational institutions, and the terminal stations of the Midland, Great Western, and Great Northern railroads. Here are located the residences of Charles Dickens, the artist Turner, Gibbon, the historian, and Faraday, the chemist. Pop., 1901, 133,329; 1911, 117,184.

MARY MAGDALENE, măg′dȧ-lēn, *or* măg′-dȧ-lē′nē, or MARY OF MAGDALA. A woman mentioned in the Gospels as a follower of Jesus and, with others, a contributor to his support (Luke viii. 2–3). Her home was doubtless at Magdala (q.v.). She had been cured of demoniacal possession by Jesus and was among his most devoted friends. With the like-minded women she was a witness of the crucifixion (Matt. xxvii. 55, 56; Mark xv. 40–41; Luke xxiii. 48–49) and of the entombment of Jesus (Matt. xxvii. 61 and parallels). The same company came to the tomb on the Sunday morning following the crucifixion, and, finding it open and empty, ran back to the city to inform the disciples (Matt. xxviii. 1–10 and parallels). But Mary appears to have soon returned alone to the tomb, and to her the risen Jesus first appeared (John xx. 1–18; Mark xvi. 9). Her joy on hearing and seeing him again was excessive, but Jesus would not permit her to touch him, to show her that the relation between them was now entirely different from what it had been. Nothing more is told of her in the New Testament. The traditional identification of her with the "woman who was a sinner" (Luke vii. 36–50) is without foundation. This idea, the ruling one in art and literature, with its accompanying conception of the word Magdalene, has therefore no basis in fact. The Eastern church held that she died at Ephesus, whence her relics were taken to Constantinople. A mediæval legend in the Western church identified her with the sister of Martha and represented her as ending her days in southern France. Consult A. B. M. Jameson, *Sacred and Legendary Art*, vol. ii (London, 1866), and *Life of St. Mary Magdalene, translated from the Italian* (2d ed., Boston, 1906). For the tradition of her life in France, consult Faillon, *Monuments inédits sur l'apostolat de Ste.-Marie-Madeline en Provence* (2 vols., Paris, 1859).

MARY MAGDALEN IN ART. A favorite subject of painters during the Renaissance and the seventeenth century. Mary is chiefly represented as standing at the foot of the cross, assisting at the entombment, as the first witness of the Christ after the resurrection ("Noli me tangere"), or as a penitent. The small pot of ointment with which she once anointed the feet of Christ is the symbol by which she is identified. Among the most important representations of the subject was the celebrated painting of Cor-

reggio, now lost, but of which a good copy by Adriaen van der Werff survives in the Dresden Gallery. Titian has probably given the most impressive representations in his "Christ appearing to Magdalen," in the National Gallery, London, and in the well-known "Penitent Magdalen," in the Pitti Palace, Florence. Other representations are by Domenichino (Pitti Palace); Carlo Dolci (Uffizi, Florence); Van Dyck (Vienna Museum); Rubens (Vienna Museum); Tintoretto (Scuola di San Rocco, Venice); Murillo (Madrid); Memling (Louvre); Veronese (Madrid Museum); and three by Guido Reni in the Louvre, National Gallery, London, and Vienna Museum.

MARY OF BUR'GUNDY (1457–82). Daughter and heiress of Charles the Bold, Duke of Burgundy and sovereign of the Netherlands, born at Brussels. On the death of Charles (1477), Louis XI of France advanced various claims to the territories over which that prince had ruled. To defend herself Mary granted great concessions to the towns of the Netherlands and married Maximilian of Austria, with whom she lived happily for five years, dying from a fall from her horse. She was a woman of great beauty, intelligence, and amiability. Through her the Netherlands came into the possession of the house of Hapsburg, passing subsequently through her son Philip the Fair to her grandson Charles V (q.v.).

MARY OF GUISE, gwēz (1515–60). Queen of Scotland. She was the daughter of Claude, Duke of Guise, and Antoinette de Bourbon, and is also known as Mary of Lorraine. At the age of 19 she was married to Louis d'Orléans, Duke of Longueville, who died in 1537. In 1538 she married James V of Scotland, who died in 1542, soon after the announcement to him of the birth of a daughter, Mary, afterward Queen of Scots. Mary of Guise was Regent of Scotland for a short period, and showed herself an enemy of the party led by Arran and an opponent of the Reformed religion. She caused her daughter to be sent to France and plighted to the future Francis II, the marriage taking place in 1558. Consult Agnes Strickland, *Lives of the Queens of Scotland* (Edinburgh, 1861), and T. G. Law, in *Cambridge Modern History*, vol. iii (Cambridge, 1904), containing a bibliography.

MARY OF SAINT ANGELA, Mother. See Gillespie, Eliza Maria.

MARY OF THE INCARNATION (1599–1672). A French educator in Canada, born at Tours. Her name was Marie Guyard, but she was married in her eighteenth year to M. Martin. She was left a widow with an infant son before she was 20. She then gave herself almost entirely to religious work, devoting herself also for 12 years to the education of her son. Finally she claimed to have entered into a mystical marriage with the Christ, and entered the Ursuline convent at Tours. In 1639 she was chosen superior of the convent of Ursulines established at Quebec by Madame de la Peltrie (q.v.), whom she accompanied to Canada. Though a mystic and a dreamer, she showed great executive ability and managed the convent with success until her death. She was tall and stately, and impressed all with the strength of her personality. Many of the letters she wrote back to France were collected and published posthumously under the title *Lettres de la vénérable mère Marie de l'Incarnation* (Paris, 1681). There is also an autobiography prepared by direction of her superiors. Consult: Martin (her son), *La vie de la vénérable mère Marie de l'Incarnation* (Paris, 1677); Charlevoix, *Vie* (ib., 1724); and the *Life* by Casgrain, published in his collected works, vol. iii (Montreal, 1886).

MA'RYPORT. A seaport and bathing resort in Cumberland, England, at the mouth of the Ellen, 28 miles southwest of Carlisle (Map: England, C 2). Shipbuilding and its kindred branches are carried on extensively, and there are manufactories of rope, duck, iron, steel, lumber, and leather. A large quantity of coal and coke is shipped, especially to Ireland. The town owns gas and water works, a slaughter-house, and markets, and maintains an isolation hospital. Maryport was the seat of a Roman camp and is rich in antiquities. It was called Ellenfoot until 1750, when it received its present name, owing to the fact that Mary, Queen of Scots, landed here in her flight from Scotland. Its prosperity dates from 1750, when its harbor was built. Pop., 1901, 11,897; 1911, 11,418.

MARY'S RIVER INDIANS, or **CHEPENAFA.** See Kalapuya.

MARY STUART (Mary, Queen of Scots) (1542–87). Queen of Scotland from 1542 to 1567. She was born Dec. 7 or 8, 1542, at Linlithgow Palace, the daughter of James V of Scotland by Mary of Guise. Her father died within a week of her birth, and she was proclaimed Queen. The English began negotiations for her betrothal to Prince Edward (later Edward VI), but, though they declared war to enforce their demands, they were unable to do so. After the Scots were defeated at Pinkie Cleugh, the young Queen was sent for greater security to an island in the Lake of Monteith. Meanwhile negotiations were opened with France for her marriage to the Dauphin (later Francis II), and these were satisfactorily concluded on July 7, 1548, whereupon Mary was sent to France. At the French court Mary received a good education and showed considerable intelligence. On April 24, 1558, her marriage to the Dauphin took place, and, contrary to the public agreements, she bound herself secretly that, if she died childless, her Scottish realm and her right of succession to the English throne, as great-granddaughter of Henry VII, should pass to France. In 1559 her husband ascended the French throne, and during his reign of over a year Mary exerted supreme influence. But the death of Francis II, on Dec. 5, 1560, destroyed all her plans. Catharine de' Medici was hostile to her; and so, on Aug. 15, 1561, after considerable negotiation with the great Protestant lords of Scotland, she left France forever and returned to Scotland.

Her government began auspiciously, and even the religious situation caused at first little difficulty. Protestantism had received the sanction of the Scottish Parliament, and Mary did not oppose this settlement, stipulating merely for liberty to use her own religion. Moreover, she surrounded herself with Protestant advisers, her chief minister being her natural brother, James Stuart, an able and ambitious statesman, whom she soon created Earl of Mar, and a little later Earl of Murray (q.v.). Her chief difficulties were to come to an amicable agreement with Elizabeth concerning the succession to the English throne. The English Queen, however, was suspicious of Mary, and the question of whom the latter would marry complicated matters further, Elizabeth fearing that an alliance of the

Scottish Queen with a powerful foreign prince, like Don Carlos of Spain, would endanger her throne. Contrary to the advice of all, Mary, on July 29, 1565, married her cousin, Henry Stuart, Lord Darnley, who had some claims to both the Scottish and English thrones. The marriage was not a love match, but chiefly due to the fact that Darnley had considerable influence with the English Catholics, who would thus aid Mary in any plans she might have to obtain the English throne. On the other hand, the marriage alienated the powerful Protestant lords of Scotland, notably Murray, who rose in rebellion, and it made Elizabeth more suspicious than ever. The insurrection of the Protestant lords was suppressed, but Mary's eyes were soon opened to the mistake of her marriage with the worthless Darnley. She was disgusted by his debauchery and alarmed by his arrogance and ambition, which went so far as to prompt him to demand that the crown should be secured to him for life, and that if the Queen died without issue it should descend to his heir. Ascribing Mary's reluctance to accede to these demands to the influence of her confidential adviser, David Rizzio, an Italian of great ability, but generally hated as a foreigner and a Roman Catholic, Darnley conspired with the Protestant nobles to murder him and seize the government. It was stipulated that Protestantism should remain the recognized religion. On March 9, 1566, Rizzio was dragged from Mary's supper room and assassinated. Mary dissembled her indignation at her husband's treachery, succeeded in detaching him from the conspirators, and persuaded him not only to escape with her from their power by a midnight flight to Dunbar, but also to issue a proclamation in which he denied all complicity in their designs. Two of the chief conspirators, Ruthven and Morton, fled to England, while Murray and the Queen became reconciled. On June 19, 1566, Mary gave birth to a son (later James VI of Scotland and James I of England); but soon afterward she quarreled more than ever with Darnley, and the latter thought of leaving the country. Meanwhile the Queen showed more and more favor to James Hepburn, Earl of Bothwell, a needy and profligate noble. About Jan. 9, 1567, Darnley fell ill. Mary brought him to Edinburgh, and he was lodged in a small mansion. Here on February 9 the Queen visited him, but left him about 10 o'clock in the evening. Early the next morning the house in which Darnley slept was blown up, and his lifeless body was found in a neighboring garden. Bothwell was undoubtedly the murderer, and it is a matter of controversy whether or not Mary was privy to the deed. A mock trial was held, and Bothwell was acquitted. On April 19 he carried the Queen to Dunbar, probably with her full consent. He divorced his young wife, Catherine Gordon, whom he had married little more than a year before, and on May 15, 1567—only three months after her husband's murder—Mary became Bothwell's wife.

This last indiscretion of Mary arrayed all her nobles in arms against her. She was able to lead an army against them, but it melted away without striking a blow at Carberry Hill, June 15, 1567. She had to abandon Bothwell and surrender herself to the confederated lords, who led her to Edinburgh, and from there to Lochleven. At the latter place she was compelled on July 24, 1567, to sign an act of abdication in favor of her son. Escaping from her island prison May 2, 1568, Mary found herself in a few days at the head of a small army, but this was defeated on May 13 by the Regent Murray at Langside, near Glasgow. Four days afterward, in spite of the entreaties of her best friends, Mary crossed the Solway and threw herself on the protection of Queen Elizabeth, only to find herself a prisoner for life.

Mary was first taken to Carlisle, but on July 13, 1568, she was removed to Bolton. Elizabeth demanded that there should be an inquiry into Darnley's murder. Mary seems to have held out at this time hopes of marriage to the Duke of Norfolk, and there were several attempts to bring about a rising among the Catholics in England and Scotland in her favor. As a result Norfolk was executed, as being implicated, on Tower Hill, June 2, 1572. Undoubtedly Elizabeth would have been glad to be rid of her dangerous prisoner, but could not on account of her relations with Spain and France at the time. Mary was moved from place to place, until in April, 1585, she was placed under the care of Sir Amyas Paulet, and here all opportunity was given her to become entangled in the conspiracy of Antony Babington (q.v.) against Elizabeth. For this she was brought to trial, and though she denied all complicity, she was found guilty, and beheaded on Feb. 8, 1587, at Fotheringay Castle. She met her fate with great composure and dignity.

Mary was reputed to be the most beautiful woman of her time. Her whole life was dramatic, and hence it has never ceased to interest poets and historians. She was a woman of great ability and varied accomplishments. Her prose writings have been collected by Prince Alexander Labanoff in his *Recueil des lettres de Marie Stuart*. Setting aside the 12 sonnets which she is said to have written to Bothwell, and which survive only in a French version of an English translation, no more than six pieces of her poetry are now known. The best is the poem of 11 stanzas on the death of her first husband, Francis II. The longest is a *Meditation*. All are in French, except one sonnet, which is in Italian.

Bibliography. The different collections of English, French, and Spanish state papers contain much material. Consult also: William Robertson, *History of Scotland during the Reigns of Queen Mary and King James VI* (2 vols., London, 1759); F. A. A. Mignet, *Histoire de Marie Stuart* (2 vols., Paris, 1851); Agnes Strickland, *Life of Mary, Queen of Scots* (2 vols., London, 1873); J. A. Froude, *History of England* (ib., 1881); Bresslau, "Die Kassettenbriefe der Königin Marie Stuart," in *Historisches Taschenbuch*, 6th series, vol. i (Leipzig, 1882); T. F. Henderson, *The Casket Letters and Mary, Queen of Scots* (Edinburgh, 1889); H. G. Bell, *Life of Mary, Queen of Scots* (2 vols., London, 1890); C. E. Lloyd (ed.), *State Trials of Mary, Queen of Scots* (Chicago, 1899); Samuel Cowan, *Mary, Queen of Scots, and Who Wrote the Casket Letters?* (London, 1901); M. M. Shoemaker, *Palaces and Prisons of Mary, Queen of Scots* (New York, 1903); T. G. Law, in *Cambridge Modern History*, vol iii (Cambridge, 1904), containing an exhaustive bibliography; Andrew Lang, *The Mystery of Mary Stuart* (London, 1904); T. F. Henderson, *Mary, Queen of Scots: Her Environment and Tragedy* (2 vols., New York, 1905); F. A. Maccunn, *Mary Stuart* (2d ed., ib., 1907); Samuel Cowan, *Last Days of Mary Stuart, and Journal of Burgoyne, her*

Physician (Philadelphia, 1907); F. A. Mumby, *Elizabeth and Mary Stuart* (Boston, 1914).

MARY SUMMER. The pseudonym of the French author Charlotte Marie (Filon) Foucaux (q.v.).

MA'RYSVILLE. A city and the county seat of Yuba Co., Cal., 52 miles by rail north of Sacramento, at the junction of the Yuba and the Feather rivers and on the Southern Pacific, the Western Pacific, and the Northern Electric railroads (Map: California, D 3). Steamers ply between here and San Francisco. A splendid levee system has been erected at a cost of $2,000,000 to protect the city from river floods. Marysville is the seat of the College of Notre Dame (Roman Catholic) and has a fine public library, handsome courthouse and city hall buildings of quaint Spanish architecture, three parks, and splendid bridges spanning both rivers. The city is in an agricultural and mining region, dredger mining on the Yuba River near Marysville having placed the county among the leading gold-producing districts in the United States. The surrounding region is rich in the production of cereals, olives, rice, prunes, raisins, and seedless grapes. Among the industrial establishments are gold-dredger and traction-engine works, flour and woolen mills, and fruit drying and canning plants. The government, under a charter of 1876, is administered by a mayor, elected biennially, and a unicameral council, elected at large, though representing the city wards. Pop., 1900, 3497; 1910, 5340.

Marysville, built on the site of a trading post called New Mecklenburg, was founded in 1849 by Charles Covilland, a Frenchman, and was called Yubaville until 1850, when it was renamed after the founder's wife. In 1851 Marysville was chartered as a city; in 1852 it had 4500 inhabitants and, in 1855, 8000; and in 1860, when the gold work began to decline, it had become, on account of a large floating population, the third city in size in the State.

MARYSVILLE. A city and the county seat of Marshall Co., Kans., 113 miles by rail west of St. Joseph, Mo., on the Big Blue River and on the St. Joseph and Grand Island and the Union Pacific railroads (Map: Kansas, F 3). It has good water power and there are grain elevators, planing mill, greenhouses, marble yard, and manufactures of flour, machinery, cigars, cement blocks, lumber, wagons, brooms, etc. Pop., 1900, 2006; 1910, 2260.

MARYSVILLE. A village and the county seat of Union Co., Ohio, 28 miles northwest of Columbus, on Mill Creek and on the Toledo and Ohio Central and the Cleveland, Cincinnati, Chicago, and St. Louis railroads (Map: Ohio, D 5). It is surrounded by a farming and dairying country and productive sheep district and has a large milk condensery, brass works, and other industrial establishments. Among the noteworthy features of the city are the State Reformatory for Women, State armory, high school ($100,000), Carnegie library, and the various county institutions. Pop., 1900, 3048; 1910, 3576.

MA'RYVILLE. A city and the county seat of Nodaway Co., Mo., 46 miles north of St. Joseph, on the Chicago, Burlington, and Quincy and the Wabash railroads (Map: Missouri, B 1). It has a State Normal School, State Farm and Experiment Station, conservatory of music, St. Francis Hospital, Carnegie library, and fine post-office and high-school buildings. Among the industrial establishments are cigar, lightning-rod, and rope-halter factories, feed mills, a garment factory, foundry, acetylene-light factory, a serum laboratory, cement-block, meat-packing, and cider and vinegar plants, etc. A large trade in grain, cattle, and hogs is carried on. The water works are owned by the city. Pop., 1900, 4577; 1910, 4762.

MARYVILLE. A town and the county seat of Blount Co., Tenn., 16 miles south of Knoxville, on the Southern, the Louisville and Nashville, and the Tennessee and Carolina Southern railroads (Map: Tennessee, G 3). It is surrounded by a farming country and has flour, woolen, and planing mills, stove foundry, aluminium works, and coffin factory. The town possesses a fine courthouse and is the seat of Maryville College (Presbyterian), which was founded here in 1819, Maryville having been settled as early as 1795. Pop., 1910, 2381.

MARZIALS, *mär'zĭ-alz, Fr. pron.* *mär'zē'ăl'*, THÉODOR (1850–). An English poet and composer, born in Brussels. His father was a Frenchman, his mother a Yorkshire woman. He passed his boyhood in Brussels and in Switzerland, and studied with M. L. Lawson in London. In 1870 he became superintendent of the Musical Department in the British Museum. In 1872 he published for private circulation a pastoral called the *Passionate Dowsabella*, republished the next year in *A Gallery of Pigeons, and Other Poems.* The volume, showing some pre-Raphaelite influence, contains poems of striking beauty. Afterward he composed, with their music, many delightful songs. His ballads in Old English style have been especially popular in England and elsewhere. In 1882 appeared *Old Songs Arranged with Accompaniments;* in 1904, *Pan Pipes.*

MASA. See MOSGU.

MASACCIO, *mä-säť chō*, properly TOMMASO GUIDI (1401–c.1428). One of the greatest Florentine painters, the pioneer of the early Renaissance in Florence. Our meagre information on his life is derived from the Florentine tax rolls. According to a statement given by his brother, he was born Dec. 24, 1401, the son of a notary, whose family, the Scheggia, were of Castello San Giovanni in the Val d'Arno. Here, it would seem, Masaccio was born. In 1422 he was enrolled in the guild of speziali (druggists), to which painters belonged, and in 1424 in the guild of painters proper. His nickname Masaccio (Hulking Tom) shows him to have been of careless and slovenly habits. In one of the tax-roll records it is stated that he lived with his mother and brother and that he neither collected what was due him nor paid his debts, from which it would seem that he was impractical in money matters. According to a notice by Vasari, based upon a contemporary statement by Landini, he lived to be only 26. That he did not attain a much greater age is proved by a tax roll of 1428, in which it is reported that he died at Rome.

In his art he was a pupil of Masolino, and was probably influenced by Brunelleschi and Donatello. He rendered very material assistance to Masolino (q.v.), perhaps even painted whole frescoes in San Clemente, Rome, as he certainly did in the celebrated Brancacci Chapel, Santa Maria del Carmine, Florence. When Masolino left these frescoes unfinished, Masaccio took charge of the work, and it was his achievements which gave them their supreme importance in

Florentine painting. Even in the works assigned to Masolino, as in the "Raising of Tabitha," the assistance of his superior pupil may be traced. The smallest of Masaccio's independent subjects is the "Expulsion from Paradise," a marvel in the rendition of movement, of the nude, and in emotional qualities. Eve cries aloud in her anguish, while Adam in deeper grief covers his face with his hands. Other frescoes of the series by him are "SS. Peter and John Healing"; "St. Peter Baptizing"; "SS. Peter and John Distributing Alms"; and "The Tribute Money." In the last-named fresco, a very large composition, Masaccio's genius is most completely expressed. Just below it, "St. Peter Enthroned" is by his own hand, as is also the design of the "Raising of the King's Son," in which the saint and the group on the left are in part by him, the remainder being by Filippino Lippi.

His frescoes in the Brancacci Chapel were epoch-making in Florentine painting. They determined the path it was to pursue to the end, and were the training school of painters as long as Florentine art remained worth while. Even Michelangelo was inspired by them, and Raphael introduced whole figures in his Vatican frescoes. What Donatello had done for sculpture and Brunelleschi for architecture, Masaccio did for painting. As early as 1436 Alberti, the greatest art theorist of the early Renaissance, ranks him with these artists and with Ghiberti and Luca della Robbia. Like Giotto, he was a supreme master of the significant. Avoiding unnecessary detail, he depicted only the essential. His naturalism was of the noble kind which does not sacrifice style. His knowledge of the nude far transcended that of the painters of his generation, and his frescoes, notwithstanding their ruined condition, evince decorative color of a high order. He was the first Italian painter with a perception of atmospheric perspective, and his landscape combines realistic with imaginative qualities of a high order.

His most important fresco, after those of the Brancacci Chapel, is the "Trinity," with the Virgin and St. John and donor and his wife, in Santa Maria Novella, Florence. The fresco in the oratory at Montemarciano seems an early work, but the Pietà in the baptistery of Empoli is more probably by Masolino (q.v.). The most important and numerous of Masaccio's surviving panels are a number belonging to an altarpiece painted in 1426 for the church of the Carmine in Pisa. Although the panels have been dispersed, the principal have been identified and an ingenious reconstruction of the altar has been attempted by Berenson. One panel, "St. Paul," is still at Pisa; four others, including the "Adoration of the Magians" and the "Martyrdom of SS. Peter and Paul," are at Berlin; while the centrepiece, a "Madonna Enthroned with Angels," belongs to the Sutton collection, Brant Broughton, Lincolnshire. Other panels of the same altar are the "Crucifixion," Naples, and "St. Andrew," belonging to Count Lanckoronski, Vienna. Mention should also be made of the "Madonna with St. Anne," in the Florentine Academy, an early but impressive panel. The portrait of a young man in the Gardner collection, Boston, ascribed by Berenson to Masaccio, is usually considered a school piece.

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MASAI, mä-sī'. A mixed people in British East Africa, east of Lake Victoria, probably of Hamitic stock. They are divided into the nomad Masai, or Il Oikob, and the settled Masai, or Wa Kwafi, the latter having been forced to become agriculturists, both on account of the plague which destroyed their immense herds of cattle and the intertribal warfare that drove them into the territory of non-Masai tribes. The Il Oikob, or "Freemen," are typical Masai and are of magnificent physique, not one of the warrior class being under 6 feet in height. Their complexion is chocolate, their hair frizzly, and their eyes slightly oblique. The pure-blooded tribes have good features and, barring their color, would pass for Europeans, while among other tribes the coarse negro features are observed. Each tribe is nomadic within certain well-marked boundaries and the subdivisions are named from their geographical location. Their villages, set in a circle in which the cattle are herded, consist of huts of bent boughs plastered with cow dung, with flat roofs. Encircling the village is a strong *boma*, or thorn fence. They practice few arts, their weapons and utensils being procured largely by barter or from a subject tribe called Andorobbo living among them. The country is elevated and the climate temperate, so that the Masai wear more clothing than the tribes in the warmer parts of Africa. The women adorn themselves with a profusion of strings of beads and circlets of iron and brass. They wear the rudiments of a dress, consisting of a small apron in front and a larger at the back. The men have an upper garment of tanned skin, a length of cloth fastened at the neck and hanging down the back, armlets of ivory or horn, ornaments of slender iron chain, and a waist cloth. The hair is gathered into a sort of chignon which hangs below the shoulder blades. The ear lobes are enormously distended by ornament.

The Masai are divided into a number of clans, the symbol of which the warriors paint on their shields. The people are divided into married men, living in the villages, and warriors, living in the camps. The latter youths are set apart by the rite of circumcision on reaching puberty, occupy separate quarters, and are attended by the unmarried women. A diet of meat and milk is allowed them, but only one of these must be eaten at a time, and between the periods a purgative treatment is required. Before going on their raids they gorge themselves with blood and meat. The warrior's costume consists of an oval headdress of ostrich feathers encircling the

face, a shoulder cape of vulture feathers, a belt and anklets of colobus monkey skin. Their weapons are a long-bladed assagai, a short sword and club, and an oval shield of buffalo hide. After serving his time the warrior settles down to married life, and then varies his flesh diet with vegetable food purchased from agricultural tribes. The Masai are dignified, self-contained, and intellectually capable. They practice no form of burial, the bodies of the dead being cast out to be devoured by hyenas. Prayers and offerings of grass dipped in cream are made to a superior deity; grass is also an offering to ward off evil. They believe in witchcraft and maintain shamans. Consult: Thomson, *Through Masai Land* (London, 1885); A. C. Hollis, *The Masai: Their Language and Folklore* (Oxford, 1905); M. Merker, *Die Masai* (2d ed., Berlin, 1910).

MASAMPO, mȧ-säm′pō; also called Masan by the Japanese. A treaty port of Chosen (Korea), on the south coast, west of Fusan. It was opened to foreign commerce on May 1, 1899. Pop., 1912, 34,000 natives, 300 foreigners, and a Japanese settlement of 3000. The climate is mild and the harbor good. Some lines of small steamers connect the town with Fusan. Its nearness to the latter city has interfered with its trade and development in the past, but the Japanese government is engaged in the construction of a naval station and a new Japanese city and hopes to make Masampo one of the most important commercial and industrial towns of south Chosen. Masampo became known to the world in 1900, through the unsuccessful efforts of the Russian government to obtain a lease of the place.

MASANIELLO, mä′zȧ-nyĕl′lō, properly Tommaso Anielio (c.1623–47). A fisherman of Amalfi, leader of the revolt which took place in Naples in 1647 against the Spanish Viceroy, the Count of Arcos. The people had been exasperated by oppression, and great excitement had been produced by a new tax laid upon fruit, the chief sustenance of the poor. On July 7, 1647, the customhouse officers were assaulted in the market place by the infuriated people, Masaniello was chosen captain, and the houses of the tax farmers were sacked. The Governor fled to the castle, and Masaniello became master of the city, dispensing justice and punishing severely all attempts at brigandage. On July 13, in the church of the Carmelites, the Viceroy agreed to restore the ancient rights of the Neapolitans and to remove the oppressive taxes. The events of the week unbalanced Masaniello's mind; he became savage, cruel, and irresponsible. The people lost faith in him because of his compromise with the Viceroy; his lieutenants were seduced by the government, and he himself was murdered by a mob, who were furious, because of his supposed desertion to the Spanish party. Auber used the story of his life in *La muette de Portici*. Consult Saavedra, *Insurección de Napoli en 1647* (Madrid, 1849). See Muette de Portici.

MÁS Á TIERRA, mäs ȧ tyĕr′rȧ. See Juan Fernandez.

MASAYA, mȧ-sä′yȧ. A town of Nicaragua, 15 miles southeast of Managua and 10 miles from the north shore of Lake Nicaragua, near the volcano of Masaya, a broad, low mountain, about 3000 feet high (Map: Central America, D 5). The town stands in the centre of a fertile region, growing tobacco, coffee, sugar, and rice, and is connected by railway with Granada and Managua. The natives manufacture cordage and palm hats. Pop., 1913 (est.), 13,000, largely native Indians.

MASBATE, mȧs-bä′tȧ. One of the Philippine Islands, situated nearly in the centre of the archipelago, about 30 miles south of the southeast end of Luzon (Map: Philippine Islands, D 4). Together with Burias, Ticao, and a few other smaller islands it forms the Province of Masbate. It is in the form of two legs of a triangle, with the large Bay of Asid opening towards the south. The eastern leg extends 82 miles from northwest to southeast, with an average width of 15 miles, and from this the western leg projects about 24 miles. The area of the island is 1236 square miles, of Burias 197, of Ticao 121, and of the whole province 1569 square miles. The island is very mountainous, rising at points to about 2500 feet; the principal chain sending out a number of spurs, extends in a semicircle from the northwest to the southeast end. Its rivers are all very short. The tropical climate is subject to frequent and sudden changes.

There are extensive forests in the interior and the principal occupation of the inhabitants is lumbering and the extraction of forest products. Stock raising, important before the Spanish-American war, has suffered greatly since from the rinderpest. Fishery is carried on to a great extent, but agriculture is in a backward state. The principal manufactures are sugar sacks and palm mats, the latter being noted for their excellent workmanship and durability of colors. The commerce is considerable, as Masbate lies not only opposite the Strait of San Bernardino, one of the two main eastern entrances to the archipelago, but also in the direct route from Manila to Samar and Leyte. There are several excellent landlocked harbors. The population of the island is about 30,000 and of the whole Province of Masbate was, in 1903, 43,675, of whom 10,183 lived in Ticao and 1627 in Burias. The tribe of the Visayans constitutes nearly 93 per cent of the population; there are also 2205 Bícols and 583 Tagalogs. The capital is Masbate, situated on the north coast; it is a port of entry, with a good harbor and a population of 4018.

Perfect peace prevailed throughout the island before the end of the year 1900, and the inhabitants showed great eagerness to have civil government established, which was done on March 18, 1901.

MASCAGNI, mȧ-skä′nyē, Pietro (1863–). An Italian composer. He was born at Leghorn, of humble parentage. Unknown to his father, the boy began to study music with Soffredini, and subsequently his uncle furnished him with the means to continue his studies. At the Milan Conservatory he worked for a little while, under Ponchielli and Saladino, but suddenly broke off his studies to make a tour with an operatic troupe. For a few years he made a precarious livelihood by conducting various traveling opera companies, until he achieved his phenomenal success in 1890 with *Cavalleria Rusticana*. The great promise held out by this work was never fulfilled. The public was carried away by the excellent libretto and the dramatic intensity of the music; but the musicians could not be blind to the glaring defects of musical workmanship and the crudity and brutality of the orchestration. Instead of remedying these

faults by means of serious study, Mascagni, intoxicated by this easily won success, continued to write. *Amico Fritz* (1891), *I Rantzau* (1892), *Ratcliff* (1894), *Silvano* (1895), *Zanetto* (1896), were complete failures. *Iris* (1898) was moderately successful. The last-named opera was revived at the Metropolitan Opera House, New York, in 1915. *Le Maschere* (1901), *Amica* (1905), again were signal failures; while *Isobel* (1911) scored a great popular success, but left the critics cold. *Parisina* (1913) met a very indifferent reception. With *L'Alodoletta* (1915) the composer ventured for the first time into the field of comedy. How a musician so deficient in the technic of his art could have occupied the post of director of the Liceo Rossini at Pesaro from 1895 to 1903 will forever remain a mystery. He made several tours of European countries, meeting with varying success. But his American tour of 1902 was a complete fiasco. Consult: G. Bastianelli, *Pietro Mascagni* (Naples, 1910), and E. Pompei, *Mascagni nella vita e nel arte* (Rome, 1912).

MASCARA, mȧs-kä′rȧ, *Fr. pron.* mȧs′kȧ′rȧ′. The capital of an arrondissement and a fortified town in the Province of Oran, Algeria, 45 miles southeast of Oran, on the slope of the Atlas Mountains. Mascara stands on the site of a Roman colony and is inclosed by walls 2 miles in length. Two of its ancient buildings remain and the city is now of the French colonial type. In 1832 it became the residence of Abd el Kader, who was born in the neighborhood. It was burned by the French in 1835, afterward regained by Abd el Kader, and finally taken by the French in 1841, since when it has developed into an important trading centre, doing an extensive trade in cereals and oil and in the famous wine that bears its name. Pop., 1901, 20,992; 1911, 24,254.

MASCARENE (mäs′kȧ-rēn′) **ISLANDS.** The collective name given to the islands of Réunion, Mauritius (qq.v.), and Rodriguez, situated east of Madagascar.

MASCARILLE, mȧ′skȧ′rēl′. A type of valet distinguished for effrontery, intrigue, and impudence, immortalized by Molière in *L'Etourdi*, *Les précieuses ridicules*, and *Le dépit amoureux*.

MASCARON, mȧ′skȧ′rŏn′, JULES (1634–1703). A French prelate and court preacher. He was born at Marseilles. He was intended for the law, but preferred the Church, and entered the Congregation of the Oratory. He began preaching in 1663, and soon attracted attention, and wherever he went in the provincial towns—as Angers, Saumur, Marseilles, and Nantes—large audiences, representing various classes, and even the learned, thronged to hear him. In 1666 he was called to the court, where his reputation continued to increase. He gained and held the favor of King Louis XIV notwithstanding his unsparing denunciation of fashionable and even royal sins. He was made Bishop of Tulle in 1671, and was transferred thence in 1679 to a more responsible position at Agen; but still continued to preach before the court. The most famous of his orations was that on Marshal Turenne (1675). Other orations which have been much admired are those on Chancellor Séguier, Queen Henrietta of England, and the Duke of Beaufort. A collection of his sermons and orations, edited by Father Borde, a member of the Congregation, was published in 1704. His sermons may also be found in a collection of funeral orations by Bossuet, Fléchier, and Mascaron (Paris, 1734). *Œuvres de Mascaron* appeared in Paris in 1828.

MASCART, mȧ′skär′, ELEUTHÈRE ELIE NICOLAS (1837–1908). A French physicist, born at Quarouble, Nord. He was educated at the Ecole Normale Supérieure. He succeeded Regnault at the Collège de France in 1872 and in 1878 he was made director of the Government Central Meteorological Bureau, a post he held until 1907, during which time he greatly improved its organization, equipment and work. He was a member of the International Bureau of Weights and Measures. He was elected a member of the Academy of Sciences in 1884, taking the place of Jamin, and in 1904 became its president. Mascart was honored with the various decorations of the Legion of Honor, being made a commander in 1889. He conducted a number of important investigations in spectroscopy, especially of the ultra-violet rays and various interference phenomena. He also made valuable studies in various fields of electricity, working in 1881–84 on the unit of resistance, and later on atmospheric electricity and terrestrial magnetism. He is the author of *Eléments de mécanique* (1866); *Traité d'électricité statique* (1876); *Leçons sur l'électricité et le magnétisme*, in collaboration with Joubert (1882); volume ii of *Méthodes de mesures et applications* (1888); *Traité d' optique* (1889), and *Traité de magnétisme terrestre* (1900).

MASCHERONI, mäs′kȧ-rō′nē, LORENZO (1750–1801). An Italian mathematician, born at Castegnetto. He was educated at the University of Pavia and at the Collegio Marsiano di Bergamo. He served as professor of literature, and after 1786 of mathematics, at the University of Pavia. Although he had been ordained to the Roman Catholic priesthood, he supported the revolutionary changes of the time, and became a deputy of the Cisalpine Republic. In 1798 he was a member of the international commission to establish a new metrical system. He wrote considerable verse, including *Versi sciolti di Daphni orobiano a Lesbia cidonia* (1793), and *Versi sciolti indirizzati alla contessa Paolina Secco-Suardi Grismondi* (1808). His mathematical writings include: *Sulle curve chè servono a delineare ore ineguali degli antichi nelle superficie piane* (1784); *Nuove ricerche sull' equilibrio delle volte* (1785); and his chief work, *Geometria del compasso* (1795).

MASCLE, mȧs′k'l (OF. *mascle*, *macle*, Fr. *macle*, from Lat. *macula*, spot). A heraldic bearing in the form of a lozenge pierced in the centre. See HERALDRY.

MASCOUTEN, mȧs-kōō′tĕn (from *Mashkodainsug*, little prairie people). An Algonquian people of the Illinois River concerning whom there has been much controversy. From a misinterpretation of their Algonquian name they were known to the Hurons, and hence to the French, as the "Fire Nation" (*Nation du Feu*). Much of the confusion in relation to the name arises from the fact that it was apparently used in a general as well as a specific sense and applied without warrant to more than one Algonquian band of the Illinois and Wabash prairies. According to the traditions of the Ojibwa and Ottawa they drove the Mascouten from the neighborhood of what is now Mackinaw, and forced them to retire to the southern end of Lake Michigan. In 1712 they joined the Foxes and Kickapoo against the French, but suffered terrible reverses, losing 150 in a single en-

counter. In the same year the Potawatomi and other Northern tribes made a concerted descent upon the Mascouten and Foxes and killed or took captive one thousand of them, pursuing the survivors as far as Detroit. The power of the Foxes was completely broken by this war with the French and their allies, and the Mascouten were so far reduced that in 1736 they were said to number but 60 warriors, living then with the Kickapoo in southern Wisconsin. They are now extinct.

MASCOV, mäs′kŏf, JOHANN JAKOB (1689–1761). A German publicist and historian, born at Danzig. He studied theology and law at the University of Leipzig, where he was afterward appointed professor of law and history. Of his publications, the following are considered of great merit: *Principia Juris Publici Imperii Romano-Germanici* (1729; 6th ed., 1769), which for a long time remained a model textbook in many universities; and *Geschichte der Deutschen bis zum Abgang der merowingischen Könige* (1726–37), a very valuable volume for the early history of Prussia, one of the first to consider the nation rather than its rulers. Consult W. Goerlitz, *Die historische Forschungsmethode J. J. Mascovs* (Leipzig, 1901).

MAS-D'AZIL, mȧ′dȧ′zēl′. An archæological grotto in the Department of Ariège, France, yielding relics especially of the latest Paleolithic period. See PALEOLITHIC PERIOD.

MASDEU, mäs-dā′o̅o̅, JUAN FRANCISCO (1744–1817). A Spanish historian, born at Palermo. He entered the society of Jesus in 1759, was professor in Jesuit seminaries at Ferrara and Ascoli, visited Spain in 1799, was exiled, and returned in 1815 to Valencia, where he died two years later. His great work, which subsequent investigations have not yet entirely superseded, and which despite its 20 volumes was not complete (continuation on the same scale would have carried it to 50 volumes), is the *Historia crítica de España y de la cultura española* (1783–1805).

MASE′FIELD, JOHN (1875–). An English poet and dramatist, born in the west of England. As a boy he was a sailor on the ship *Conway,* and made many voyages. Not only at sea but on land was his early life adventurous; among other occupations he had been a farm laborer, and a bar-tender in a New York saloon. These experiences of the lower strata of society were later to prove grist for his literary mill. When he abandoned the sea, ceased roaming, and established himself in or near London, Masefield became a constant writer in prose and in verse. In 1912 the Royal Society of Literature awarded him the Edmond de Polignac prize for poetry. His best poetic work is, perhaps, found in his ballads of the sea, and in such narrative poems as *The Everlasting Mercy* and *The Widow in the Bye Street,* memorable for the vitality of their stark realism, for their terrible pathos, and for the curiously monotonous but effective chant that the verse form supplies. His sketches and stories of the sea, with the savor of storm-tossed brine about them, are appealing in their blend of romance and picturesque realism. His stories for boys are in a vein to please young readers. His plays, impressive, if sometimes crude, show remarkable evidence of a rapidly increasing power; they are essentially plays for reading, however, rather than for the theatre. The following list of Masefield's varied productions is representative of the range of his work: *Salt-Water Ballads* (1902); *Sea Life in Nelson's Time* (1905); *A Mainsail Haul* (1905; reissue, 1913), tales and sketches of the sea; *On the Spanish Main, or Some English Forays* (1906); *Captain Margaret, A Romance* (1908); *The Tragedy of Nan and Other Plays* (1910); *The Tragedy of Pompey the Great* (1910), an historical drama; *Ballads* (1910); *The Street of To-day* (1911); *William Shakespeare* (1911), in the "Home University Library"; *Jim Davis* (1912), a story for boys; *The Story of a Roundhouse and Other Poems* (1912); *The Everlasting Mercy,* and *The Widow in the Bye Street* (two narrative poems, written earlier than 1913, but then published in one volume); *Philip the King* (a drama), *and Other Poems* (1914). In addition Masefield wrote introductions to *Hakluyt's Voyages,* the *Voyages of Marco Polo,* and selections from Daniel Defoe, and edited *The Voyages of Captain William Dampier* (1906).

MASÈRES, mȧ′zâr′, FRANCIS (1731–1824). An English mathematician, historian, jurist, and reformer, born in London, of Huguenot descent. He was educated at Clare College, Cambridge, obtained a fellowship, and was admitted to the bar. Soon afterward he went to Canada and in 1766 was appointed Attorney-General, which position he held for three years. He lived in Quebec until 1773. Upon his return to England the same year he became cursitor baron of the Exchequer (1773–1824). He was also senior judge of the Sheriff's Court, London (1780–1822). When the Quebec Act (q.v.) was being debated in the House of Commons, Masères was one of the important witnesses, but testified in partial opposition to Sir Guy Carleton (Lord Dorchester) (see CARLETON), whose recommendations were finally embodied in the Act. Masères, although of French descent, had strong Protestant prejudices, which led him to oppose the granting of full civil and religious freedom to the French Canadians. He published: *Principle of Life Annuities Explained in a Familiar Manner* (1783); *Scriptores Logarithmici* (1791–1807); *Scriptores Optici* (1823); *Select Tracts on Civil Wars in the Reign of Charles I* (1815); besides a large number of scientific papers, political, historical, and religious books and pamphlets.

MASH′AM, ABIGAIL, LADY (1670–1734). A friend and confidante of Queen Anne of England. She was born in London, the daughter of Francis Hill, a merchant, and his wife Mary Jennings, an aunt of the Duchess of Marlborough, by whose influence she was appointed a lady of the bedchamber to Princess Anne. She became the confidante of the Princess, and, after the latter became Queen, her genial personality increased in the royal favor as the imperious bearing of the Duchess became more and more intolerable. In 1707 Abigail was married to Samuel Masham, a gentleman of the bedchamber to Prince George of Denmark. This marriage brought about an open rupture with the Marlboroughs. The intrigues of Mrs. Masham finally resulted in the overthrow of the Whigs, the elevation of Harley to power, and the dismissal of the Duke of Marlborough. Mrs. Masham was engaged in plots to bring back the Stuarts, and she seems always to have used her position for her pecuniary advantage. Her husband was raised to the peerage in 1712. Lady Masham adhered to Bolingbroke in the quarrel between him and Oxford. After the death of Queen Anne in 1714 she lived in retirement. See ANNE.

MASHAM, SAMUEL CUNLIFFE LISTER, first

BARON (1815–1906). An English inventor. He was born near Bradford, and in 1838 his father set him up in the worsted-milling business at Manningham. During his lifetime he took out more than 150 patents, mostly in connection with cloth making. His wool-combing machine was especially profitable, and so greatly was it in demand that he made a profit of nearly $5000 on each machine sold. His silk combing for utilizing silk waste became a success in 1864, and by 1878 he had developed a velvet loom that yielded him a million dollars' profit annually. He was made first Baron of Masham in 1891. He published *Lord Masham's Inventions* (1905).

MASHERBRUM, mŭsh'ĕr-brụm. See HIMALAYA.

MASHONALAND, mȧ-shō'nȧ-lănd. One of the two divisions, or provinces, of Southern Rhodesia, between Matabeleland and the Zambezi River (Map: Congo, F 6). It consists mainly of a fertile, savanna-covered plateau, 3000 to 5000 feet above the sea, intersected by several affluents of the Zambezi and the Sabi. The climate is healthful to Europeans. Gold has been found in considerable quantities. The white population in 1911 numbered 12,631; native population, 495,451; in addition there were a number of Asiatics and other colored persons. The chief towns are Hartley, Umtali, Gatooma, Victoria, and Salisbury, the capital of southern Rhodesia, with 3479 white inhabitants in 1911. A railway from Beira, on the coast of Portuguese East Africa, was opened, via Umtali, to Salisbury in May, 1899. In October, 1902, a railway 301 miles in length was completed between Salisbury and Bulawayo (in Matabeleland). The main line ("Cape-to-Cairo" railway) was completed in June, 1904, from Bulawayo 282 miles to Victoria Falls, where it crosses the Zambezi on a bridge 650 feet long, 30 feet wide, and about 420 feet above the water. The bridge was formally opened in September, 1905. In 1889 Mashonaland was acquired by the British South Africa Company, and in 1893 the company's possession was secured through a successful war with the Matabeles, who in July of that year began hostilities by a raid into Mashonaland. See RHODESIA.

The ruins of south Mashonaland, of which the best known are those of the Zimbabwe group, are numerous. Along the gold-bearing reefs are thousands of excavations into the quartz veins as well as many hundred ancient ruins, temples, fortresses, and the like. The early history of this region was not known by the Mashonas who were living here at the time of the advent of the Europeans. The announcement of the finding of the ruins by the traveler Carl Mauch in 1871 attracted much attention, and in 1891 Theodore Bent surveyed and described the ruins of Zimbabwe. He found one portion to be elliptical with a round tower and to cover a considerable area of a gentle rise; below this in the valley lay a mass of ruins; while another structure, apparently a fort, crowned a bold, rocky hill. The walls are constructed of small, squared blocks of rough-face granite, laid dry, and occasionally having ornamental courses in herringbone or chevron pattern. The walls are very thick, in some places standing over thirty feet, and the coursing and broken joints show fair skill in masonry. The elliptical ruin has several gateways, the interior is broken by walls into a labyrinth, and in a central space are an altar and two remarkable round towers, the latter built solid. Monoliths of rough, unhewn blocks of granite, set in the ground, occur in these ruins, and in some cases the monoliths are set upright on the top of the wall. The hill fort consists of curving walls built among gigantic granite boulders, forming a maze above a cliff 90 feet high, and is flanked on the accessible side by a wall 36 feet high and 13 feet thick at the top. Around the rude altar in the temple ruins were found phallic emblems, birds, and decorated bowls carved from soapstone. Remains of gold smelting furnaces with crucibles and pottery blowpipes, and stone ingot molds, were discovered, and glass beads, celadon pottery, Persian pottery, and Arabic glass occurred in the ruins. Spearheads and arrowheads, battle-axes, bells, chisels, spades, and other tools were taken out. The ruins have been ascribed to the pre-Mohammedan Arabs, probably of the Sabæo-Himyaritic period, so that there seemed good reason for locating the Land of Ophir in this region. These conclusions were challenged by Randall-MacIver, who holds that glass and porcelain sherds not older than of the 14th century occur in the lowest strata examined, and that accordingly the ruins are of merely mediæval antiquity. This view is also accepted by Von Luschan, who regards practically all the finds as of Kaffir origin. On the other hand, Passarge pleads for an old Sabæan culture, which may have become deteriorated and invested with a Kaffir veneer.

The Mashonas are a Bantu negro people, whom the Matabeles have driven to live in hill forts overlooking their fields. They are peaceful agriculturists, raising corn, sweet potatoes, rice, tobacco, and Indian hemp. They have herds of cattle and goats, and a common occupation is hunting for gold. The Mashonas are of chocolate-brown color, above the average height, slender in build, and the young women have good figures and are graceful. The men wear bracelets of buffalo hide, necklaces of bone and claws of gazelle hoofs, and aprons of leather interwoven with beads of iron and brass. Their headdress is of feathers and their coiffure is elaborate. The two front teeth are filed to a V-shape. The women shave their heads, but young girls string beads on their hair. They wear aprons, and their bodies are decorated with raised tattooing. The warriors carry three assagais, a club, shield, and battle-axe. The bow and arrow are also used. They are skillful iron smelters and workers, using the double bellows and working out implements and weapons with stone tools. They also make pottery, wooden dishes, and bark cloth. They smoke and snuff tobacco and use the narcotic hemp to excess. Travelers remark on their fondness for heat; many are disfigured from scorching caused by sleeping too near the great fires. Their musical instruments are the African harp, jew's-harp, and drum.

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MASH'PEE. A settlement of New England Indians in Barnstable County, Mass., established as a reservation in 1660. From that time to the present they have intermarried with negroes and whites, but 206 of them still claim their Indian identity.

MAS'INIS'SA, or **MAS'SINIS'SA** (c.239–148 B.C.). King of the Massylians, in eastern Numidia. He was educated at Carthage, receiving a thorough training in Latin and Greek, and in 213 B.C. induced his father to form a league with the Carthaginians, with whom he fought successfully, in 212, against Syphax, King of the Massæsylians, in western Numidia, the ally of the Romans. He then passed over into Spain at the head of a troop of Numidian cavalry, and displayed great zeal and valor in the war against Rome. But the victory of the Romans at Silpia in 206 B.C., and (so the story goes) the action of the Carthaginians in giving Sophonisba, the beautiful daughter of Hasdrubal (son of Gisco), who had been promised him in marriage, as wife to his old rival Syphax, led Masinissa to enter into an alliance with the Romans. The Carthaginians incited Syphax to make war upon him. Defeated and stripped of his sovereignty, which he had just inherited from his father, Masinissa was compelled to seek refuge on the coast of Syrtis, where he bravely defended himself until the arrival of Scipio in 204 B.C., when he identified his cause with that of the Romans. He defeated Syphax, overran his country, captured Cirta, his capital, and took prisoner his Queen, Sophonisba, whom Masinissa still loved. Scipio, who feared the influence of the Carthaginian princess, demanded her surrender as a captive of war, and Masinissa, to spare her the shame, gave her poison to drink. In the decisive battle of Zama, which followed the arrival of Hannibal in Africa (202 B.C.), he made a brilliant charge at the head of his Numidian horse, drove the cavalry of Hannibal from the field, and was the first to turn the tide of battle against the Carthaginians. For this service he received the Kingdom of Syphax in the following year. He now profited by the leisure which peace afforded him, devoting his attention to the organization of his government, and to the civilizing of his semibarbarous subjects. He put the finances on a sound basis, and developed a formidable army and fleet. But his lust of conquest was never satiated. He made continuous inroads into the territory of Carthage, and his depredations finally drove the Carthaginians to war (150 B.C.), an event which the Romans seized as a welcome pretext for intervening and utterly crushing their ancient rival. Consult Meltzer-Kahrstedt, *Geschichte der Karthager*, vol. iii (Berlin, 1913).

MASK (Fr. *masque*, origin uncertain; probably from Sp. *máscara*, from Ar. *maskharat*, buffoon, mask, from *sakhara*, to ridicule). A disguise or covering of the face, worn either to aid in the simulation of some character or for other purposes, as in the rites of savage people for the frightening away of demons or even protecting the faces of the dead. The use of masks in the drama originated perhaps in the harvest festivities of the most ancient Greek peasantry, appearing subsequently to have been associated with the representation of Satyrs, Silenus, and Bacchus in the orgies of Bacchus. In Greek tragedy, which was an outgrowth from these, masks were used from the first, and in comedy at least at a later day. Regular types of masks were developed for the different characters in tragedy and comedy, expressive of fixed emotions. They were often provided with metallic mouthpieces for the purpose of increasing the power of the voice, as was made necessary by the great size and openness of the ancient theatres. Their use indeed was adapted both to the vastness of the buildings and to a formal style of dramatic representation in which the ideal prevailed over any reality of individual impersonation. In the modern theatre the use of masks, coming down through the mimes and pantomimes of the Romans and the early Italian *commedia dell' arte* (comedy of masks), has been chiefly confined to that class of entertainments in which the very names of the characters, like Pantaloon and Harlequin (q.v.), have been derived from Italy. The use of masks at costume balls also originated in Italy, where the domino, or half mask, worn by ladies, became especially popular.

The name death masks is given to masks, usually of plaster, made after death. In the preparation of these masks the face of the dead body is usually covered with oil, and plaster of Paris is then applied. After the plaster has hardened it is removed, being prevented by the oil from adhering too closely to the skin. Into the mold thus formed fresh plaster is poured, and the resulting cast is the death mask. Such masks are of the utmost value as exact resemblances of the faces from which they are taken, although the change of contour caused by death necessarily impairs to some extent their value. Similar masks are occasionally made from living men. Here, however, the mobile expression is frequently of necessity sacrificed, so that it is in general true that the more expressive the living face, the fainter is the likeness, while a set and determined face gives, as a rule, a clear and accurate mask. The use of death masks is both ancient and widespread. The Romans made them of wax, while among the Egyptians and in the ruins of Hissarlik masks of thin gold plate have been found, and among the American Indians occasional specimens have been discovered.

Among certain groups of savages, masks play an important rôle in their ceremonials. They are sometimes constructed to imitate living forms, as of animals, but more often to portray mythological characters. As a consequence the imagination of the maker is allowed a certain freedom, and the result is seen in the grotesque productions which are familiar from the ethnological collections of our museums. They are most commonly employed in shamanistic rites and in dances of a religious and more or less secret character. Their use is perhaps most prominent in North America, particularly among the tribes on the North Pacific coast, and in the islands of the South Seas, notably in the Melanesian group. The French form of the word, "masque" (q.v.), is now used in English to designate a form of drama in which the mask is, or was originally, worn.

Bibliography. Ficorini, *Le maschere sceniche e le figure comiche d' antichi Romani* (Rome, 1736); id., *De Larvis Scenicis et Figuris Comicis* (ib., 1754); Sand, *Masques et bouffons* (Paris, 1860); F. A. O. Berndorf, *Antike Gesichtshelme und Sepulcralmasken* (Vienna, 1878); W. H. Dall, *Masks, Labrets, and Certain Aboriginal Customs* (Washington, 1885); Laurence Hutton, *Portraits in Plaster* (New York, 1894); Altmann, *Die Masken des Schauspielers* (3d ed., Berlin, 1896); L. V. Frobenius, *Die Masken und*

Geheimbünde Afrikas (Halle, 1898); C. H. Hart, ed., *Brouwere's Life Masks of Great Americans* (New York, 1899); Fritz Karpf, "Ueber Tiermasken," in *Woerter und Sachen*, vol. v (Heidelberg, 1913).

MASK. In architecture and decoration, the face of a human being or animal, conventionalized in character; sometimes called a *mascaron* (French). The Greeks and Romans copied the tragic and comic masks of their actors in sculpture and painting for decorative purposes, and similar designs, but with exaggerated grotesqueness, were popular with the late Renaissance artists, especially of the Baroque period, for the keystones of doorways and other prominent positions.

MASKAT, mȧ-skät′. A town of Arabia. See MUSCAT.

MASKED PIG. An extraordinary breed of domestic swine, cultivated in Japan. It is black, has a short head, broad forehead and muzzle, great ears, and deeply furrowed skin; and thick folds of skin, which are harder than the other parts, resembling the plates on the Indian rhinoceros, hang about the shoulders and rump.

MASKEGON, mȧs-kē′gon (Swamp People). A wandering Algonquian people, a division of the Cree, scattered over the immense swamp region of British America, stretching from Lake Winnipeg to Hudson Bay, including the basins of the Nelson and Severn rivers. In former times they lived entirely by hunting and fishing, to which those upon reservations now add lumbering and a little farming. As they are officially classed with the Cree, no reliable estimate of their population can be given, but they may number from 1500 to 2000.

MAS′KELL, WILLIAM (c.1814–90). An English theologian, born at Bath. From University College, Oxford, he graduated B.A. in 1836, and the next year took holy orders. In 1842 he became rector of Corscombe in Dorsetshire, where he began his researches in Church history, particularly in the Anglican ritual. He produced at this period the *Ancient Liturgy of the Church of England* (1844); *History of the Martin Marprelate Controversy* (1845); and *Monumenta Ritualia Ecclesiæ Anglicanæ* (1846). These works placed him among the most able exponents of High Church doctrines. Resigning Corscombe, he became vicar of St. Mary's Church near Torquay, and domestic chaplain to the Bishop of Exeter (1847). His earlier investigations were now followed by *Holy Baptism* (1848); *An Enquiry into the Doctrine of the Church of England upon Absolution* (1849); and a volume of doctrinal sermons. He took an active part in the Gorham controversy (q.v.); and when Gorham won his case in the Privy Council, Maskell went over to the Church of Rome (1850). To the Privy Council he had addressed two memorable letters on the *Present Position of the High Church Party* (1850). Maskell never took orders in the Church of Rome. His later life was passed in the west of England, where he resumed his learned researches, publishing, among several works, *Protestant Ritualists* (1872) and *Ivories Ancient and Mediæval* (1875). He died at Penzance, April 12, 1890.

MASKELYNE, mȧs′ke-līn, NEVIL (1732–1811). An English astronomer, born in London. He was educated at Westminster and at Cambridge; carried out numerous investigations characterized by extreme accuracy of work, and became in 1765 Astronomer Royal and director of the observatory at Greenwich. He introduced into navigation the method of determining longitude by lunar distances. He founded *The Nautical Almanac* in 1767, and published *The British Mariner's Guide* (1763); *Astronomical Observations* (1765); and other works.

MASKINONGE, mȧs′kī-nŏnj, or **MUSKELLUNGE,** mŭs′ke-lŭnj (Algonquin, great pickerel, from *mas*, great + *kinonge*, Chippewa dialect *kenozha*, *kinoje*, pickerel, from *kenose*, long). The great pike (*Lucius masquinongy*, or *Esox nobilior*) of the lakes of the northern United States and Western Canada, from the Ohio River northward. This magnificent fish, the largest of its family, and the most to be feared as a predatory force in American fresh waters, has the general form of a pike (q.v.), a length of from four to eight feet, and often a weight exceeding 100 pounds. It is swift, strong, and fierce, and a high prize for the angler. Its characteristics are its dark-gray color, the sides in the typical form (confined to the Great Lakes) with blackish spots of varying size on a grayish-silvery ground; the fins are spotted with black; and the opercle and lower parts of the cheeks are scaleless. See Colored Plate of AMERICAN GAME FISHES, accompanying article TROUT.

MASK′WELL. In Congreve's *Double-Dealer*, the scoundrel from whose character the play is named.

MASOCH, LEOPOLD VON SACHER. See SACHER-MASOCH, LEOPOLD VON.

MASOLINO DA PANICALE, mä-sō-lē′nō dȧ pä′nē-kä′lȧ (1384–c.1440). A Florentine painter of the Renaissance. The facts of his life are little known and much disputed. According to the traditional account, based upon Vasari, he was born at Panicale di Valdelsa, whence his usual name; but Crowe and Cavalcaselle identify him with Tommaso di Cristoforo Fini, in which case he would have been born at Florence. Masolino is a diminutive of Tommaso, which was certainly his given name. There is nothing to confirm Vasari's statement that he was an assistant of Lorenzo Ghiberti; but the statement that he was a pupil of Gherardo da Starnina, a later Giottesque master, is not unlikely. In 1423 he was admitted to the guild of physicians and apothecaries, in which the painters were enrolled. In 1426 he departed for Hungary, where he painted under the patronage of Fillippo Scolari, a Florentine who had attained a position of great importance there. In 1428 he was employed at Castiglione di Olona.

His only undisputed works are two, one a series of frescoes at Castiglione di Olona, in the Province of Como, northern Italy. Of these one representing the "Life of the Virgin," which is signed by the master, is in the Collegiate Church. Another more interesting series, representing the "Life of St. John the Baptist," is in the Baptistery near by; while the Palazzo contains an independent landscape with decorative friezes. Of the frescoes in the Baptistery the "Feast of Herod," "Herodias and Salome," and the "Baptism of Christ" are especially noteworthy. They reveal a transitional art, still containing mediæval elements, but Renaissance in viewpoint and in many salient features—such as the perspective, classic decoration, a naturalistic conception of the human body studied from the nude, and strictly realistic portraiture in contemporary costume.

A second series of frescoes, originally attrib-

uted to Masolino by Jakob Burckhardt, and now generally considered his work, is in a chapel of San Clemente, Rome. The subjects, representing episodes from the lives of SS. Ambrose and Catharine, and a Crucifixion, have been much repainted. "St. Catharine before the Philosophers" and the "Martyrdom of St. Catharine," with a remarkable landscape, are masterly presentations. The frescoes as a group seem earlier in date than those at Castiglione di Olona and there is much in them that reminds of Masaccio, to whom they have also been attributed. It seems indeed quite likely that Masolino was assisted here by his more talented pupil. This was unquestionably the case in the world-famous frescoes of the Brancacci Chapel, Santa Maria del Carmine, Florence. According to a tradition, dating from the time they were painted, Masolino received the commission but left it unfinished, and it was continued by Masaccio. The problem of the authorship is further complicated by the circumstance that they were finally completed by Filippino Lippi (q.v.). The principal subject of the frescoes is the "Lives of SS. Peter and Paul," and according to the best criticism, the following are by Masolino: "St. Peter Preaching"; "The Raising of Tabitha," "St. Peter Healing the Cripple," and the "Fall of Man." Compared with the adjacent productions of Masaccio they seem lacking in reality, power, and significance. Their author strives after ideal beauty rather than actuality. They show an abstract rather than a realistic beauty of line, imposing composition, and tender modeling. Among other subjects attributed to him are: a Gothic panel of the Madonna (1423) in the Kunsthalle, Bremen; a still earlier Madonna with God the Father and angels at Munich, two panels in the Naples Museum; "Christ in Glory" at Strassburg; an "Annunciation" at Gosford House, Scotland; frescoes of the "Pietà" in the Baptistery of Empoli, and of the "Madonna with Angels," in San Fortunato, Todi.

Bibliography. The principal monograph is by Toesco, *Masolino da Panicale* (Bergamo, 1908); also, A. H. Layard, *The Brancacci Chapel and Masolino, Masaccio, and Filippino Lippi*, published by the Arundel Society (London, 1868); Schmarsow, *Masaccio Studien* (Cassel, 1895–1900); Bernhard Berenson, "Quelques peintures méconnues de Masolino da Panicale," in *Gazette des Beaux-Arts*, ser. 3, vol. xxvii (Paris, 1902); id., in *Study and Criticism of Italian Art*, vol. ii (London, 1902); Crowe and Cavalcaselle, *History of Painting in Italy*, ed. by Douglas and Strong (New York, 1903); for data on the life of Masolino: Milanesi, *Storia dell' arte toscana* (Florence, 1873).

MA'SON, Alfred Edward Woodley (1865–). English novelist and politician, born at Dulwich and educated at Dulwich College and at Trinity, Oxford. From 1906 to 1910 he was a Liberal member of Parliament representing Coventry. He gained popularity as a novelist, his work including: *A Romance of Wastdale* (1895); *The Courtship of Morrice Buckler* (1896); *The Philanderers* (1897); *Parson Kelly* (1899), with Andrew Lang; *Miranda of the Balcony* (1899); *The Four Feathers* (1902); *The Truants* (1904); *Running Water* (1907); *At the Villa Rose* (1910); *The Witness for the Defense* (1911), a play; *The Turnstile* (1912); *Open Windows* (1913), a play; *Green Stockings* (1915), a comedy.

MASON, Charles (1730–87). An English astronomer. He was employed as an assistant at the Greenwich Observatory from 1756 to 1760 and was sent with Jeremiah Dixon to the Cape of Good Hope in 1761 to observe the transit of Venus. In 1763 they were employed by the proprietors of Maryland and Pennsylvania to survey the boundary line between their respective possessions. The boundary fixed by them has since been known as "Mason and Dixon's line" (q.v.). They also fixed "the precise measure of a degree of latitude in America." The particulars of this work are recorded in vol. lviii of the *Philosophical Transactions*. Mason and Dixon returned to England in the autumn of 1768. In the following year Mason went to Cavan, Ireland, to observe the transit of Venus, his report of which appeared in the *Philosophical Transactions* for 1770. He was also employed by the Board of Longitude to verify the lunar tables of Tobias Mayer; these were published after his death under the title of *Mayer's Lunar Tables Improved by Charles Mason* (London, 1787). His private journal, field notes, etc., were found among a pile of waste paper in the cellar of the Government house at Halifax, Nova Scotia, in 1860, and an account of their contents was published by Porter C. Bliss in the *Historical Magazine* for July, 1861.

MASON, Daniel Gregory (1873–). An American composer and writer on music, born at Brookline, Mass. He graduated from Harvard University in 1895, studied music in Boston, New York, and Paris, and became assistant professor of music and extension lecturer at Columbia University. He composed an Elegy for piano (1901); Sonata for violin and piano (1912); Pastorale for violin, clarinet, and piano (1913); *Country Pictures* for piano (1913); and is author of *From Grieg to Brahms* (1902); *Beethoven and his Forerunners* (1904); *The Romantic Composers* (1906); *A Student's Guide to Music* (1909); *A Neglected Sense in Piano Playing* (1912); *Music as an International Language* (1913); *Guide to Music* (1914).

MASON, Francis (1799–1874). An American missionary and Orientalist. He was born at York, England, came to the United States in 1818, entered Newton Theological Seminary in 1827, and in 1830 was sent as a missionary to Burma. His labors were chiefly among the Karens. Into two dialects of their language—Sgaw and Pwo—he translated the Bible and other religious books, and a seminary for the training of preachers and teachers was conducted by him. He published, in 1852, *Tenasserim, or the Fauna, Flora, Minerals, and Nations of British Burma and Pegu*, a second edition of which appeared under the title *Burma: Its People and Natural Productions* (1860; 3d ed. by Theobald, 2 vols., 1882–83). He also published, besides translations from the Burman, Pali, and Sanskrit: *Life of Ko-Thah-Byu, the Karen Apostle; A Memoir of Mrs. Helen M. Mason* (1847); a *Memoir of Sau Quala* (1850); *Pali Grammar on the Basis of Kachchayano, with Chrestomathy and Vocabulary* (1868); *The Story of a Workingman's Life, with Sketches of Travel* (1870), an autobiography.

MASON, George (1725–92). An American political leader of the Revolutionary period, born in Stafford (now Fairfax) County, Va. He was an intimate friend and neighbor of Washington, was a member of the Ohio Company, and as early as 1759 was a member of the Virginia Assembly. He was a leader of the opposi-

tion in Virginia to the Stamp Act, and in 1769 drafted the nonimportation resolutions, which were presented by Washington and adopted by the Assembly. At a popular meeting of the citizens of Fairfax County held July 18, 1774, he offered twenty-four resolutions on the issues between Great Britain and the Colonies in which were outlined both the nonintercourse policy with Great Britain and the scheme of a general intercolonial Congress. These resolutions were sanctioned by the Virginia Convention in August, and were reaffirmed by the Continental Congress in October of the same year. Mason served on the Virginia Committee of Safety, and occupied a seat in the Virginia Constitutional Convention of 1776. In the latter capacity he earned distinction as the author of the well-known Bill of Rights which constitutes so notable a part of the Virginia Constitution of 1776, and which was probably the most complete as well as the most advanced statement of the rights of man that had then appeared. In 1777 the Legislature, of which he was still a member, elected him to the Continental Congress; but he declined to serve and remained an active and influential member of the Legislature for many years. In 1780 he outlined a plan which was subsequently adopted by Virginia for ceding to the Federal government her claims to the territory north and northwest of the Ohio River. In 1787 he became a member of the Constitutional Convention at Philadelphia, and took an active part in the debates on the Constitution. He spoke against the provision for the continuance of the slave trade and disapproved of the instrument as a whole. He refused to sign it, and, with Patrick Henry in the Virginia Ratification Convention of 1788, threw his influence against ratification and proposed twenty alterations, some of which were afterwards adopted. He was chosen as one of the first United States Senators from Virginia, but declined to serve. With Madison and Jefferson, Mason carried through the Virginia Legislature measures disestablishing the Episcopal church and protecting all forms of worship. His death occurred October 7, 1792, at "Gunston Hall," and his statue, with those of other distinguished Virginians, stands in front of the State Capitol at Richmond. Consult Rowland, *Life and Writings of George Mason* (2 vols., New York, 1892).

MASON, George Heming (1818–72). An English landscape and figure painter, born in Staffordshire. He first studied medicine, but afterward went to Rome, where he earned a living painting portraits, though he had had no regular artistic training. He returned to England in 1858. Mason's pictures represent English or Roman subjects, treated in an idyllic manner. They are softly harmonious in color, but lacking in vigor and truth to nature. Among the best are: "Ploughing in the Campagna" (1857), "Dancing Girls" (1868), "Harvest Moon" (1872), "The Cast Shoe," and "Wind on the Wold," the last two in the Tate Gallery, London.

MASON, James Murray (1798–1871). An American lawyer and legislator, best known as one of the representatives of the Confederate government in Europe during the Civil War. He was born on Mason's Island, Fairfax County, Va.; graduated at the University of Pennsylvania in 1818, and practiced law for some time at Winchester, Va. He soon became prominent in politics, and was a member of the Virginia House of Delegates from 1826 to 1832, of the Virginia Constitutional Convention of 1829, of the national House of Representatives from 1837 to 1839, and of the United States Senate from 1847 to 1861. Mason, having absented himself about March 20, during the session of the Senate for executive business, did not again take his seat. He was expelled by formal vote (July 11) at the special session of the Thirty-seventh Congress, which met under the call of President Lincoln, July 4, 1861. In Congress he was conspicuous as an upholder of slavery and as an ardent advocate of the principle of States' rights, and in 1850 he drafted and introduced the famous Fugitive Slave Law, which formed part of the compromise measures of that year. For ten years he was chairman of the Senate Committee on Foreign Affairs. Late in 1861 he was appointed commissioner of the Confederate government to England, and on the night of October 12 started from Charleston, S. C., with John Slidell, the Confederate commissioner to France; but having reached Havana about the twenty-second of October, he and Slidell were seized on board the British steamer *Trent* by Captain Wilkes of the United States ship *San Jacinto* and were confined at Fort Warren, Boston, until Jan. 2, 1862, when the United States government, yielding to the demand of England, ordered their release. Their seizure caused great excitement on both sides of the Atlantic and threatened to bring on a war between the United States and Great Britain. (See Trent Affair, The.) After his release Mason proceeded to London, where he endeavored to win over the British government, and the British people as well, to the side of the Confederacy, but he was never received officially by the ministers, and in September, 1863, his commission was withdrawn. He, however, remained in Europe, spending his time principally in Paris and London and vainly attempting to induce France and England to intervene actively on the side of the Confederacy. Immediately after the war he returned to America. Fearing arrest at the hands of the Federal government, he lived in Canada until 1868, when he removed to Virginia and thereafter until his death lived near Winchester. Of Mason Mr. Charles Francis Adams has this to say: "He was in many, and by no means the best ways, a typical Virginian. Very provincial and intensely arrogant, his dislike of New England, and especially of Massachusetts, was pronounced and only exceeded by his contempt."

MASON, Jeremiah (1768–1848). An American lawyer and legislator. He was born in Lebanon, Conn., graduated at Yale in 1788, was admitted to the bar in 1791, and began the practice of his profession at Westmoreland, N. H. He removed to Walpole, N. H., in 1794, and in 1797 to Portsmouth, which was his home for the next thirty-five years. He was soon recognized as the head of his profession in a State whose bar was unequaled in America and which could number among its members Ezekiel and Daniel Webster and Jeremiah Smith. He was appointed Attorney-General of the State in 1802 and was elected to the United States Senate in 1813. He became one of the foremost debaters in that body, his speech delivered in 1814, on the Embargo, being especially powerful; but in 1817 he resigned his seat to continue the practice of his profession. He afterward served for a number of terms in the New Hampshire Legis-

lature, where his service had little connection with politics, but was given largely to revising and codifying the State laws. In 1832 he removed to Boston, where, until his age compelled him to retire, he maintained the high reputation which he had previously won.

MASON, John (1586–1635). The founder of New Hampshire. He was born at Lynn Regis, Norfolk, England; served in 1610 in the navy; in 1616 went to Newfoundland as Governor of the colony, and in 1620 published a description of the country, to which he added a map in 1626. He explored the New England coasts in 1617; in 1622 obtained a grant of a region called Mariana, now the northeastern part of Massachusetts; in the same year, in connection with Sir Ferdinando Gorges, procured a patent for the Province of Maine; and in 1623 sent a colony to the Piscataqua River. In 1629 he obtained a patent for the New Hampshire colony, and with Gorges took one also for Laconia, a region including Lake Champlain. He held various honorable positions in England: in 1625–29 he was treasurer and paymaster of the English army engaged in war against France and Spain; in 1632 he was made vice president of the Council for New England; and in 1635 he was a judge in Hampshire and vice admiral of New England. His rights in New Hampshire were sold in 1691 to Governor Samuel Allen. He died in London in December, 1635, and was buried in Westminster Abbey. Consult Tuttle, *Memoir of Captain John Mason, the Founder of New Hampshire*, in an illustrated edition of Mason's tract on Newfoundland, published for the Prince Society (Boston, 1887).

MASON, John (1600–72). An American Colonial commander. He was born in England; served under Sir Thomas Fairfax in the Netherlands; emigrated in 1630 to Dorchester, Mass.; in 1633 obtained a military command at Boston; and in 1635 aided in founding Windsor, Conn. In 1637 he was placed in command of a small force of English and Indians sent against the Pequots (q.v.). After the destruction of that tribe Mason removed to Saybrook, at the request of the inhabitants, for the defense of the Colony. In 1651, when New Haven attempted to found a settlement on the Delaware, it was proposed to put Mason in command, but the General Court at Hartford would not consent to his removal from Connecticut. In 1659 he removed to Norwich. He was a major of the Colonial forces for thirty years, Deputy Governor of Connecticut in 1660–70, and chief judge of the Colonial court from 1642 to 1668. He prepared, at the request of the General Court of Connecticut, a *Brief History of the Pequot War*, which was incorporated by Increase Mather in his *Relation of Trouble by the Indians* (Boston, 1677, republished with introduction by the Rev. Thomas Price, Boston, 1736). Consult G. E. Ellis, "Life of John Mason of Connecticut," in Jared Sparks, *Library of American Biography*, vol. xiii (Boston, 1864).

MASON, John (1858–1919). An American actor, born at Orange, N. J., and educated at Columbia University. He made his first regular appearance on the stage at the Walnut Street Theatre, Philadelphia, in 1878. The next year he joined the company of the Boston Museum, and remained there four years, playing leading parts. For the next ten years he was connected with various companies, playing a great variety of rôles and greatly increasing his ability as an actor. He made his first appearance abroad at the St. James's Theatre, London, in 1891, scoring a decisive hit as Simeon Strong in *The Idler*. In 1900 he joined Daniel Frohman's company at Daly's Theatre, New York, appearing in *The Ambassador*, *The Interrupted Honeymoon*, *The Man of Forty*, and *Lady Huntsworth's Experiment*. He was leading man with Mrs. Fiske in 1905, playing, among other parts, Lövborg in *Hedda Gabler*, and Paul Sylvaine in *Leah Kleschna*. During 1906 he appeared in *The Liars*, *The Tyranny of Tears*, and various other successful plays. In the next year he scored a great success as Jack Brookfield, the gambler, in Augustus Thomas's *The Witching Hour*. Subsequently he appeared in Thomas's *As a Man Thinks* (1911), Bernstein's *The Attack* (1912), a revival of *Liberty Hall* (1913), and *Big Jim Garrity* (1914).

MASON, John Young (1799–1859). An American politician, born at Greensville, Sussex Co., Va. He graduated at the University of North Carolina in 1816, and in 1819 was admitted to the bar. After serving as a member of the Virginia Assembly and as a delegate to the Virginia State Constitutional Convention of 1829, he was a member of Congress from 1831 until 1837. When in Congress he was chairman of the Committee on Foreign Affairs. He next served as judge of the United States District Court for Virginia from 1837 until 1844, when President Tyler made him Secretary of the Navy, an office which he retained until Tyler's death. He entered the cabinet of President Polk as Attorney-General, but in 1846 again took up the portfolio of the Navy, which he held for three years. In 1853 President Pierce made him Minister to France, where he remained until his death. On Oct. 10, 1854, he met Buchanan and Soulé, the ministers of the United States to England and Spain, respectively, in a conference at Ostend, and in conjunction with them issued the famous Ostend Manifesto (q.v.).

MASON, Sir Josiah (1795–1881). An English manufacturer of pens. Born at Kidderminster, he began selling cakes in the streets when only eight years old, and later taught himself to read and write while serving as shoemaker's apprentice. He tried his hand at various trades, and finally in 1824 he set up as a manufacturer of split-steel key rings, for which he had invented special machinery. He began manufacturing steel pens in 1829, and rapidly developed an immense business, which he sold to a limited liability company in 1875. He added to his fortune by gold and silver plating in connection with the Elkington Brothers, and by copper and nickel smelting works. Between 1858 and 1868 he built up a great orphanage at Erdington at a cost of nearly $1,500,000, and for this he was knighted in 1872. He also gave more than $1,000,000 to endow Mason's College (now part of the University of Birmingham), which was opened in 1880. Consult J. T. Bunce, *Sir Josiah Mason: A Biography* (London, 1882).

MASON, Lowell (1792–1872). An American music teacher, born in Medfield, Mass. When only 16 he directed a church choir at Medfield and upon his removal to Savannah continued his interest in musical affairs. In 1827 he returned to Boston, where he became president of the Handel and Haydn Society and strongly advocated the Pestalozzi system of teaching. He founded the Boston Academy of

Music (1832), and in 1837 went to Germany to study musical pedagogic methods. He is remembered chiefly for his numerous hymn tunes, which are still in general use throughout the country, and his collections of songs: *Boston Handel and Haydn Collection of Church Music* (1822); *Juvenile Psalmist* (1829); *Lyra Sacra* (1837); *The Sabbath Hymn and Tune Book* (1859), with E. A. Park and Austin Phelps; *The Psaltery* (1845); *Carmina Sacra* (1841); *New Carmina Sacra* (1852).

MASON, Otis Tufton (1838–1908). An American ethnologist, born at Eastport, Me. He graduated in 1861 at Columbian (now George Washington) University and was principal of the preparatory school of the university (1861–84). He became curator of ethnology in 1884, and head curator of the department of anthropology in 1902, in the United States National Museum. Mason founded the Anthropological Society of Washington; was anthropological editor of the *American Naturalist* and of the *Standard Dictionary;* and wrote, besides many reports published by the government: *Summaries of Progress in Anthropology; Woman's Share in Primitive Culture* (1894); *The Origin of Inventions* (1895); *Indian Basketry* (2 vols., 1904). He was a contributor to the New International Encyclopædia.

MASON, William (1724–97). An English divine and poet, born probably at Kingston-upon-Hull. He was educated at Cambridge, and in 1749 became a fellow of Pembroke College. He was appointed rector of Aston in Yorkshire, and chaplain to the Earl of Holderness in 1754. The next year he visited Germany, and in 1757 was appointed chaplain in ordinary to the King. Subsequently he was for more than thirty years preceptor and canon residentiary of the cathedral at York. Among his writings are *Musæus* (1747), a monody to the memory of Pope; *Isis* (1748), a monologue denouncing the Jacobitism of Oxford; and the dramatic poems *Elfrida* (1752) and *Caractacus* (1759). He also wrote a number of odes in imitation of his friend Gray, of whom he published a *Life* in 1774. The first book of *The English Garden* appeared in 1772, and in 1782 he published a *Critical and Historical Essay on Cathedral Music.* His collected works were issued in 1811. A tablet to him was erected in the Poets' Corner of Westminster Abbey.

MASON, William (1829–1908). An American musician, born in Boston. After having studied music in Europe with Hauptmann, Moscheles, Richter, Dreyschock, and Liszt, he appeared as a pianist in Prague, Frankfort, Weimar, and London, and upon his return to the United States made several successful tours. In 1855 he settled in New York, and founded there the Mason and Thomas recitals of chamber music, which were continued until 1868. After 1855 he devoted himself almost entirely to teaching and composing. His works include numerous compositions, mostly for the pianoforte, but he is best known for his textbooks: *A Method for the Pianoforte* (1867), *System for Beginners* (1871), both in collaboration with E. S. Hoadley; *Touch and Technic* (1878); *A Primer of Music* (1894); and his interesting *Memories of a Musical Life* (1901).

MASON, William Pitt (1853–). An American chemist, born in New York City. He graduated at Rensselaer Polytechnic Institute (C.E., 1874; B.S., 1877), and studied medicine at Union University (M.D., 1881), and bacteriology at the Pasteur Institute in Paris. At Rensselaer he was an assistant from 1875 to 1893, and thereafter professor of chemistry. His works include: *Examination of Potable Water* (1890); *Water Supply* (1896; 3d ed., 1902); *Notes on Qualitative Analysis* (1883; 5th ed., 1908); *Examination of Water* (1899; 4th ed., 1913).

MASON AND DIXON'S LINE. The boundary line between the States of Maryland and Pennsylvania, as run by two English surveyors, Charles Mason and Jeremiah Dixon, during the years 1763–67, and popularly accepted prior to the Civil War as the dividing line between the free States and the slave States. The line is that which was agreed upon in the settlement of a dispute between the States of Maryland and Pennsylvania over their respective boundaries as described in their charters. The chief controversy turned upon the meaning of the phrases "the beginning of the 40°" and "the beginning of the 43° of N. Lat." employed in the description of the Pennsylvania boundary. The quarrel, in which Lord Baltimore and Penn soon engaged, continued for more than eighty years; was the cause of much trouble between individuals; and occupied the attention of the proprietors of both provinces, the Lords of Trade and Plantations, the High Court of Chancery, and the Privy Councils of three kings. No compromise was reached during the life of Penn, but after his death his sons succeeded in obtaining from Charles, Lord Baltimore, in 1732, an agreement by which the boundary line was to be drawn by commissioners representing both parties to the controversy. Baltimore at once came over with his commissioners, but on becoming dissatisfied with the agreement he prevented its immediate execution. The unsettled condition of the boundary, therefore, continued and with it increasing disturbances in the disputed territory. The Governor of Maryland then laid the matter before the Proprietary and the King, and invoked their intervention for the settlement of the dispute. By an Order in Council the King commanded both sides to keep the peace and instructed the Proprietaries to grant no lands in the disputed territory until the boundary could be adjusted. Pending a decision of the question by the English Court of Chancery, to which the matter was submitted in 1735, both parties agreed upon a provisional boundary. A decision was finally reached in 1750 by the Chancellor, Lord Hardwicke, which, with the agreement of 1732, served as the basis of a compromise between the proprietors in 1760. Commissioners representing both sides were appointed, and the eastern boundary was determined. To run the east and west line, as well as other parts unsettled, Mason and Dixon were appointed in 1763, and at once entered upon their task. By the year 1767 they had carried the line over the mountains to a point 244 miles from the Delaware River. Farther advance was stopped by the Indians, but the line was subsequently completed by others. The boundary was marked by milestones, every fifth one having the arms of Baltimore engraved on one side and those of Penn on the other. Its exact latitude is 39° 43′ 26.3″ North. A resurvey of the line was made in 1849. Between 1901 and 1903 another resurvey was made by the States of Pennsylvania and Maryland. The work was placed under the direction of the commission consisting of the Superintendent of the

United States Coast and Geodetic Survey, the Secretary of Internal Affairs of Pennsylvania, and the Director of the Geological Survey of Maryland.

Bibliography. W. H. Browne, *Maryland, the History of a Palatinate* (Boston, 1884); T. C. Donaldson, *The Public Domain* (3d ed., Washington, 1884); W. R. Shepherd, *History of Proprietary Government in Pennsylvania* (New York, 1896); B. A. Hinsdale, *The Old Northwest* (Boston, 1899).

MASON BEE. A bee of the subfamily Osmiinæ of the family Megachilidæ; especially in the United States one of the genus *Osmia*, and in Europe one of the genus *Chalicodoma*. The name is derived from the manner in which these bees construct small earthen cells, sometimes mixed with sand, pebbles, and wood scrapings, glued together so firmly that they are smooth inside. Ten to twenty of the cells are usually found together, and each one contains a store of honey and pollen for the larvæ, only one of which is found in each of the cells. These bees show a high order of intelligence in the manner in which they adapt themselves to circumstances, and this accounts for the very great diversity seen in the situations in which the cells are placed. *Ceratosmia lignivora* is a true wood borer. Certain species excavate the pith of brambles, alternately widening and contracting the burrow to correspond with the proposed cells and the intervals between them. Others use the hollows of reeds and straws; two European species utilize the empty shells of several species of Helix, compactly filling each shell with their cells, which are placed in different relative positions according to the exigencies of the case, and then carefully closing the entrance with pellets of clay, sticks, and pebbles; others again plaster their cells thickly upon the underside of a flat stone which is slightly raised from the ground; and still another species places its cells in comparatively unprotected situations at the roots of grass. The Chalicodomas make very perfect masonwork in the walls of their cells.

The food stored up in the cells is composed of a mixture of honey and pollen. Réaumur and Fabre experimented with the young bees to find whether they were able to overcome additional difficulties in making their way out of the cell. When the mouth of the cell is covered with earth and pith or brown paper put in contact with the covering of the cells, the bees make their way out without any great apparent difficulty, but when some space intervenes between the mouth of the cell and the new barrier, the bees are unable to gain their freedom. The Osmiinæ are of comparatively small size, and are usually of dark metallic colors. The eggs are white, oblong, and about the size and shape of a caraway seed. They hatch in about eight days. Development of the larvæ is rapid; they spin delicate cocoons and winter as pupæ.

Consult: L. O. Howard, *Standard Natural History*, vol. ii (Boston, 1884); Henri Fabre, *Insect Life*, translated from the French (London, 1901); id., *Mason Bees* (New York, 1914); L. O. Howard, *The Insect Book* (New York, 1914). See Plate of WILD BEES with the article BEE.

MASON CITY. A city and the county seat of Cerro Gordo Co., Iowa, 72 miles northeast of Fort Dodge, on the Chicago Great Western, the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, the Chicago, Rock Island, and Pacific, and other railroads (Map: Iowa, D 1). The city has a public library, a fine courthouse, hospitals, and two city parks, and is the seat of the National Memorial University and of an Odd Fellows' Orphans' Home. Its population is increasing rapidly, and it enjoys considerable industrial and commercial prosperity. There are important agricultural, grain, and live-stock interests, and a wholesale trade in groceries, fruits, etc.; also sandstone quarries, extensive cement, brick, and tile works, flour mills, lime works, sash and door factories, gasoline-engine factory, a large packing house, and foundries. Mason City, settled about 1855, adopted the commission form of government in 1913, the power being vested in a mayor and two commissioners. The city owns and operates the water works. Pop., 1900, 6746; 1910, 11,230; 1914 (U. S. est.), 13,495; 1920, 20,065.

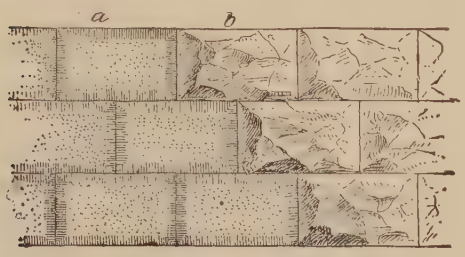
MA'SONRY. The art and trade of construction in stone. The term is also somewhat loosely used of work in brick or concrete. It is the fundamental art in building and engineering work, even where a framework of wood or iron is used for a large part of the superstructure, and has been practiced from the earliest antiquity. The masonry of the ancient Egyptians is extraordinary, whether we consider the size of the materials, or the unequaled exactness with which they are fitted together without the use of mortar. Cyclopean or polygonal masonry, of which remains exist in many parts of Greece and Italy, as well as Asia Minor, also exhibits stones of great size with carefully adjusted joints. The walls of Mycenæ and Tiryns are among the earliest examples. They are built with huge irregular blocks, the spaces between being filled up with smaller stones. The ancient Italian masonry is usually more carefully executed. In some cases the beds or horizontal joints are made level and the upright joints left unsquared. No mortar is used in cyclopean masonry.

The masonry of the Greeks of historic times was usually of carefully coursed and squared blocks, equal, at its best, to the finest Egyptian work. Many of the Roman buildings in the East were constructed with blocks of enormous size, as at Baalbek (q.v.) in the second century, where some of the stones are 60 feet in length. But the typical Roman system was that of masses of cemented rubble or coarse concrete between facings of brick or of marble ashlar, or, in more ordinary work, of small blocks of tufa set cornerwise (opus reticulatum). Such walls were stuccoed on their interior faces. Roman vaulting was executed in masonry of cut stone, brick, or concrete, according to circumstances.

The mediæval builders of western Europe carried masonry in stone to a high pitch of both scientific and artistic perfection, using rubble and random ashlar in preference to coursed ashlar, and producing with stone of moderate size edifices of extraordinary impressiveness. The perfection of their cutting of moldings and of ornament rivals that of the finest Greek work.

Modern stone masonry involves the labors, after the quarrying, of the *stonecutter* who hews the stones into shape (often at a stoneyard or shed far from the building), the *mason* who lays them in place, and the laborer or *helper* who brings the mortar when mixed. A *carver* or sculptor carves the ornamental work. Masonry is classified according to the treatment of the exposed surface into quarry-faced, pitch-

faced, and dressed. *Quarry-faced masonry* is that in which the faces of the stones are left as they come from the quarry; it is used chiefly for massive engineering works and basements of large buildings. *Pitch-faced masonry* is that in which the face of the stones is rough but the edges are dressed to straight lines. *Dressed masonry*, as the name indicates, is that in which the face of the stones is dressed to a more or less smooth plane surface; it may be hammered, tooled, smooth-rubbed or polished. *Range masonry* is that in which the horizontal joints or courses are continuous throughout. *Broken-range masonry* is that in which the horizontal joints are not continuous throughout, so that a portion occupying a given height in two courses may abut against another having one or three courses in the same height. *Ashlar masonry* is masonry of carefully squared blocks, as distinguished from that of blocks not squared at



ASHLAR MASONRY.

the ends. In the finest work all the blocks are of the same size, the length usually twice or thrice the height, and the vertical joints of each course centred under the blocks of the next. In the figure, *a* shows hammered ashlar with tooled or chisel draft; *b*, pitch-faced ashlar. *Random*, or *random-coursed*, ashlar is masonry of squared stones of various sizes, laid without continuous horizontal beds. (The American usage which would confine the term ashlar to mere facings of cut stone is inaccurate.) *Rubble masonry* is that composed of unsquared stone, laid with or without an attempt to approximate regular courses.

Some of the other current definitions of stone-masonry work are as follows: *Face*, the front surface of a wall; *back*, the inside surface; *facing*, the stones which form the face of a wall; *backing*, the stones which form the back of a wall; *filling* or *core*, the material between the inner and outer facings, or between the backing and facing, in very massive work; *batter*, the slope of the surface of a wall; *course*, a horizontal layer of stone in a wall; *joints*, the meeting surfaces of the stones (the horizontal joints are called *beds*); *coping*, a course of stone on the top of the wall to protect it; *quoins* are squared stones, alternately long and short, forming the corners of buildings or projecting wings; *pointing*, a finishing of the visible joints with fine mortar; *bond*, the arrangement of stone in adjacent courses; *stretcher*, a stone whose greatest dimension lies parallel to the wall; *header*, a stone whose greatest dimension lies perpendicular to the wall; *dowels*, pegs set in holes in adjacent faces of two stones to prevent slipping; *cramps*, bars of iron having the ends bent to enter holes in the upper surfaces of adjacent stones.

Ashlar masonry is used for works in which great strength or a finished and elegant effect is required. The thickness of the mortar joints in the very best class of ashlar masonry for building purposes is about ⅛ inch; for railway and bridge masonry about ¼ inch to ½ inch. The arrangement of headers and stretchers varies; the strongest arrangement is where a header and a stretcher are used alternately. Dowels and cramps are used where exceptional strength is required. Ashlar masonry is usually backed with rubble masonry, brickwork, or concrete, the backing being built simultaneously with the facing. In certain classes of stone masonry, such as bridges and architectural work of importance, the stones are cut to exact dimensions and to special forms. In lighthouse construction these special forms are sometimes quite intricate. See LIGHTHOUSE.

Rubble masonry is employed for backing ashlar, for rustic work, and other uses not requiring great strength or elegant finish. The stones are prepared for laying by simply knocking off the weak corners and loose pieces. All interstices are filled with small pieces of stone and mortar, and the mortar joints are made thick enough to prevent adjacent stones from touching. Very often rubble masonry is laid without mortar, and is then called dry rubble masonry.

A highly important and refined branch of masonry is that of arches and vaults, not only in bridges and tunnels, but in monumental architectural works, as in the superb vaults of the mediæval cathedrals and churches and some modern works. This kind of masonry involves the application of the geometric science or art of *stereotomy*, or *stonecutting*, for the preparation of *templets* or patterns of each face of each stone used. See STEREOTOMY; VAULTING.

The excellence of masonry depends on the quality of the stone and of the mortar and the care with which the stones are cut, laid, bedded in mortar, and bonded. Not only must the exposed face of each stone be correctly shaped, but the *beds*, or horizontal surfaces of the top and bottom, must be dressed to a true plane for a sufficient depth from the face. The mortar may be of sand and lime; of sand, lime, and cement: of sand and cement; or, in hydraulic work, of pure cement; properly proportioned and mixed, and so applied as to fill all interstices between the stones. In the finest work the visible joints do not exceed ⅛ inch in thickness; in heavy, rustic, and engineering work they may be much thicker. The strength of masonry (or the safe load it will carry) varies from 10 tons per square foot for ordinary rubble to 25 or 30 tons for the best granite ashlar.

There are, besides the common kinds of masonry described above, various special forms, especially in English work. In *herringbone* masonry long thin slabs of stone, or bricks, are laid obliquely in courses having the slope or inclination alternately reversed. *Bowlder* masonry is that which is composed of large, rounded field stones or bowlders laid up without cutting, as in rustic walls and basements. *Flint rubble* is a finishing of the face of a rubble wall with a heavy coat of mortar in which white flint stones are set as closely as possible. *Rustic* or *rusticated* masonry is a form of ashlar having the joints deeply cut or beveled, or the body of the block in strong relief with a depressed border or draft around it.

Brick Masonry. With due allowance made for the difference of the material and dimensions,

brick masonry corresponds very closely to dressed ashlar masonry. The bond used is varied considerably, but is usually either the English bond or the Flemish bond. (See BRICKWORK.) The mortar used in brickwork may be either lime mortar or cement mortar, the former being most used in ordinary building. Brickwork should carry safely a load of 20 tons per square foot when laid in lime mortar.

Concrete Masonry. Concrete masonry, strictly speaking, signifies blocks of concrete laid like stone masonry. The term is, however, sometimes loosely applied to monolithic or massive concrete formed while plastic in temporary molds, especially when used in connection with true masonry of stone or brick. For the various processes of building in concrete, see CONCRETE. In English usage, and to some extent in the United States, the terms "masonry," "masonwork," and "mason" are exclusively applied to work in stone. Masonry of brick is "brickwork" and "bricklaying," and a brick mason is a "bricklayer." As these trades are distinct in the United States, as in Great Britain, good usage warrants the general observance of a like distinction in the use of these terms here. For a comprehensive treatise on masonry work, consult: I. O. Baker, *Treatise on Masonry Construction* (10th ed., New York, 1909); F. E. Kidder, *Mason's Work* (9th ed., ib., 1909); W. F. Patton, *A Practical Treatise on Foundations* (2d ed., ib., 1909). See BUILDING; BRICK; CEMENT; CONCRETE; MORTAR; QUARRY; STONE CUTTING AND DRESSING; STONE, ARTIFICIAL.

MASONS. The Masonic fraternity, variously referred to as ANCIENT FREE AND ACCEPTED MASONS, or FREE AND ACCEPTED MASONS. It is the largest, oldest, and most widely distributed secret society in the world. Lodges of Masons are found in every civilized country except Russia, where, for obvious political reasons, the society, although it took root there at times, has never flourished. Accurate totals of membership from all foreign countries are unavailable. Those for the United States are official. Of the approximately 2,348,000 active members in the world, 67 per cent are in the United States, about 23 per cent are in Europe, and 16 per cent in the United Kingdom.

Freemasonry as known to-day is an English creation and dates back only to London in 1717. Comparatively few of the lodges of Masons in the United Kingdom have been traced back for 100 years prior to 1717; beyond that definite record of their existence is lost. They come down, of course, in a general way in English history as operative (stone) mason lodges, survivals of the guilds which built churches, cathedrals, and bridges during the Middle Ages. Volumes have been written in efforts to trace the origin of Masonry, an organization evolved from a few surviving mason lodges in England and Scotland a little more than 200 years ago. The story of its origin being at the building of King Solomon's temple and that it has had an uninterrupted existence since, is a myth.

Owing to the completion of the era of church and cathedral building throughout Europe 300 years or more ago, and to the results of the Reformation and the Thirty Years' War, there were comparatively few surviving guilds of stonemasons and builders, which during the Middle Ages had traveled through Europe, originally under the patronage of the Church. The latter had conferred privileges on them, hence free masons. The guilds in England have a manuscript record that a general assembly of masons was held at York, under the patronage of Edwin Athelstan, where a code of laws was adopted which, as alleged, became the foundation of later Masonic constitutions. Traveling guilds of builders held a general assembly at Strassburg in 1275, and again in 1375, at which a fraternity was formed with apprentices, craftsmen, and masters among the members, and with an initiatory ceremony and a sign—perhaps the first traveling operative Freemasons, under protection of Church and State.

With the decline of church building the guilds gradually disappeared. In France guilds which were the outcome of the colleges of artificers accompanying the invasion of the Roman legions were abolished in 1539. A later French builders' fraternity, called the Companionage, possessed a remarkable legend of the death of the master builder, which modern Masons will be interested to learn antedated the establishment of modern Freemasonry at London in 1717. The Roman occupation of northern Europe naturally left an influence on the mason guilds of Germany, France, and Britain, but the German and French guilds disappeared between 1500 and 1600. From some time prior to 1600, until early in the eighteenth century, surviving British mason guilds began to accept as members persons not operative masons or workers, whence Free and Accepted Masons. This, whether the result of a fad or not, brought many distinguished and well-to-do men into the fraternity (1660–1700), after which the so-called work of the lodges was only in the symbolism of the labor performed by earlier masons. From this came speculative in contrast with the operative masons.

When four surviving old lodges met in London in 1717 and formed a Grand Lodge there was but one degree of Masonry. By 1724 the three degrees of entered apprentice, fellowcraft, and master mason were all in the ritual and have constituted ever since what has been called universal Masonry, the possession of which everywhere has been a prerequisite to membership in all later Masonic rites.

Keen search has been made by Masonic historians for an explanation of the world range, down through the ages, of the symbols found in the rituals of Freemasonry. A large part of the collection is attributed to the research and ingenuity of antiquarians and other learned men who, late in the seventeenth century, made the mystical ornamentation for the surviving mason guilds in England, and this was supplemented by an effervescence of activity in this direction immediately after the original Grand Lodge of England was formed at London in 1717.

The Essenes of the first three centuries perfected the kabbala, of which there is a suggestion in Masonry. The Culdees, apostolic monks of Eastern origin, found later in Britain, were drawn on for early architecture. Elias Ashmole, eminent antiquarian, one of the early "accepted masons," was a Rosicrucian, and as that cult did, so Masonry displays the double and single triangles, a point within a circle, and the hexagon. From the mason guilds were derived the square and compasses, King Solomon's temple and its two pillars, St. John the Baptist, the five, seven and nine, and various words, grips, and signs. Whether it was the triangles or the lion of the Gnostics, it may be noted that these all appeared after the accession of antiquarians

APPROXIMATE NUMBER OF MASONS THROUGHOUT THE WORLD,

BY COUNTRIES, IN THE YEAR PRIOR TO THE OUTBREAK OF THE GREAT WAR IN EUROPE, 1914–15

	Master Masons 1914	Royal Arch Masons 1913	Royal and Select Masters 1913–14	Knights Templars 1914
Alabama	26,397	3,943	701	1,663
Arkansas	20,534	4,261	625	1,385
Arizona	2,118	695	....	495
California	50,257	12,692	2,847	7,446
Colorado	16,139	5,197	931	‡3,190
Connecticut	24,281	9,011	5,894	4,118
Delaware	3,358	*1,144	....	....
District of Columbia	9,599	3,567	....	1,683
Florida	11,437	2,134	260	1,209
Georgia	38,425	7,255	913	3,299
Idaho	4,012	1,134	....	‡699
Illinois	122,233	37,350	8,444	‡17,897
Indiana	63,035	16,384	7,923	7,549
Iowa	47,585	12,580	1,950	7,016
Kansas	40,668	9,794	1,936	6,234
Kentucky	40,459	9,329	1,941	4,987
Louisiana	15,152	3,386	612	1,023
Maine	29,872	10,151	4,799	5,609
Maryland	15,766	3,857	1,652	2,158
Massachusetts	63,290	24,165	8,957	§17,894
Michigan	71,752	22,462	8,482	9,107
Minnesota	27,447	8,823	1,554	4,599
Mississippi	19,103	4,432	2,444	2,056
Missouri	58,237	13,658	2,728	7,008
Montana	6,977	†1,940	....	1,307
Nebraska	20,144	4,770	1,678	2,728
Nevada	1,886	489	....	....
New Hampshire	10,620	4,409	2,593	‡2,735
New Jersey	36,649	6,986	1,206	3,451
New Mexico	3,208	1,081	....	‡667
New York	186,179	39,398	6,792	22,783
North Carolina	22,314	3,092	604	1,598
North Dakota	8,666	2,534	....	1,548
Ohio	90,666	35,160	17,018	‡16,639
Oklahoma	23,353	4,922	883	2,378
Oregon	12,315	3,724	783	‡1,707
Pennsylvania	110,630	33,188	6,088	22,974
Rhode Island	8,461	4,111	2,490	....
South Carolina	14,281	2,842	748	‡1,431
South Dakota	10,221	2,233	....	1,829
Tennessee	26,242	5,434	1,119	1,802
Texas	58,724	18,860	15,767	6,235
Utah	2,081	598	....	465
Vermont	13,610	4,276	1,637	2,783
Virginia	23,392	7,058	....	‡3,336
Washington	18,407	4,130	1,366	‡2,184
West Virginia	15,768	5,943	....	3,922
Wisconsin	28,082	11,110	3,567	‡4,999
Wyoming	3,036	945	....	672
Other in Grand Body	....	....	1,113	‡1,097
Totals, United States	1,557,068	437,637	120,947	229,594
Alberta	5,382	....	....	....
British Columbia	6,344	....	....	....
Ontario	53,699	‖18,333	....	....
Manitoba	6,455	....	....	....
New Brunswick	3,320	†821	....	....
Nova Scotia	6,528	1,439	....	....
Prince Edward Island	769	....	....	....
Quebec	7,362	1,418	....	....
Saskatchewan	4,500	....	....	....
Totals, Canada and Provinces	94,359	22,011	....	7,324

	Master Masons 1914
Total, Mexico	3,000
Total, Central America	1,000
Total, Cuba, Porto Rico, West Indies, etc.	10,000
Brazil	29,000
Argentina	4,500
Peru	2,600
Chile	1,000
Bolivia	500
Paraguay	1,000
Other South American countries	1,000
Total, South America	39,600
England, Scotland, and Ireland	370,000
Germany	63,000
France	40,000
Italy	15,000
Sweden	15,000
Hungary	6,000

	Master Masons 1914
South Australia ¶	4,904
New South Wales	17,524
West Australia	3,949
Victoria	12,310
New Zealand	12,695
Tasmania	1,443
Total, Australasia	52,825
South Africa	8,000
Egypt	2,000
Rest of Africa	3,000
Total, Africa	13,000
Holland	4,600
Switzerland	4,300
Denmark	4,100
Norway	4,000
Portugal	4,000
Austria, Rumania, Greece, Luxemburg, Servia, Belgium	11,000

Total, Europe	541,000
India, China, Japan, Straits Settlements	15,000
Hawaii, Philippines, and other Pacific islands	2,000
Approximate grand total for all countries	2,348,852

* 1914. † 1912. ‡ 1913. § Including Rhode Island, 1913 ‖ Ontario and the Northwest.
¶ Probably very much understated. Unsettled conditions prevent full reports.

and historians, Englishmen in professional, literary, and scientific life who became the accepted masons and who devised the symbolic building, the second temple, "a house not made with hands," etc.

Thus symbolic Freemasonry now presents that which suggests a dipping into almost all the mystical schools of philosophy and religion, pagan and Christian, by the operative masons of the Middle Ages; also into the Vehmgerichte, or German Society of Free Judges of the thirteenth century, and into the symbolism and teachings of the Pythagoreans, on top of all which must be included the legend of the master's degree as by far the most impressive feature, the pinnacle of dramatic symbolism placed on the English or symbolic rite about 1725. Whether it was dug up and borrowed from the archives of the French Companionage, successor to French mason builders of the Middle Ages, may never be known. If it is not, the coincidence is one of the most remarkable recorded.

Thus upon the bare skeleton of a secret brotherhood, which only tradition said had come down through the ages, was lavished a wealth of mystical symbolism gathered from the records of creations of man's religious and ethical aspirations. The supply of raw material was so abundant that, after the impulse given the work of upbuilding Freemasonry which culminated in 1717–25, when the three symbolic degrees, or "blue-lodge" Masonry, were perfected, a second period of elaboration of the possibilities of Masonic degrees and rites marked the remainder of the eighteenth century. This era in which Masonic degree factories were operated overtime extended in reality from late in the seventeenth century to early in the nineteenth. As each new degree or rite appeared, in England or on the Continent, the framers with rare judgment made eligible to membership only those who had received the original or first three degrees of Masonry. Thus, though rites have come and rites have gone, whatever the value or status of the added grades or degrees, the only genuinely universal Masonry continues to be the three degrees of entered apprentice, fellowcraft, and master Mason.

Within 10 years after the four remaining Masonic lodges in London had formed the Grand Lodge of England in 1717, organized Freemasonry had spread throughout the United Kingdom, to the Continent of Europe, and to many British colonies, including, in 1730, those in America. Thus began what has been called the revival of Freemasonry, its historic period, in which the international spread of the formation of lodges was greatly aided by vogue which the fraternity had acquired in England. Through British army and navy lodges, and by coöperation from Masons, members of the British diplomatic service abroad, Masonic lodges sprang up within a few years in almost all quarters of the world.

The first grand master of the newly formed Grand Lodge of England was Anthony Sayre, followed by George Payne in 1719 and by Dr. John Theophilus Desaguliers in 1719. Payne succeeded to the office in 1720, in which year the general regulations for the craft were compiled. These were revised by Dr. Desaguliers and Rev. James Anderson, a Scottish Presbyterian clergyman, and published in 1723 under the title of *Charges of a Freemason.* Prior to 1717 lodges met when and where desired, elected a master for the communication, and did Masonic work. After the Grand Lodge was organized lodges were created by warrant, elected permanent officers, and met at stated locations. The fraternity then took on the distinct characteristics for which it has since been known. Requisites for admission were and are a belief in a Supreme Being and in the immortality of the soul, under which Christians, Jews, Mohammedans, Indians, and others who are believers in a God are eligible to membership. No atheist can become a Mason.

The Mason is instructed that his fraternal obligations involving aid or assistance to members are to be subordinated to the duty he owes to God, his country, and his family, with full recognition of the duty he owes to his fellow men. The fraternity differs radically from the secret, beneficiary (insurance or other) societies, and from the Independent Order of Odd Fellows, the next largest secret, international fraternal association, in that its measure of relief or charity extended among members is purely voluntary, dependent on the need in each individual case. It is in no way part of a contract or other understanding that such-and-such distress on the part of brethren shall call for specific financial or other recognition or care.

The craft in England as well as on the Continent was early patronized by royalty, which gave it a distinction gained then or since by no other like society.

In 1724 a Grand Lodge of all England was formed by an old lodge at York, which claimed to date from the assembly of Masons said to have been held there in the year 926. It, however, maintained friendly relations with the Grand Lodge of England in 1717, and died a natural death in 1792. In 1751 nine lodges, chartered by the Grand Lodge of England, seceded, charging that the Grand Lodge of 1717 had departed from some of the old landmarks. It has ever been a Masonic law that the landmarks may not be changed. These formed a Grand Lodge of England according to Old Institutions, and styled themselves Ancients and called the original Grand Lodge adherents Moderns. Then followed the historic Masonic schism, which continued until the reunion of 1813 in the United Grand Lodge of Ancient Freemasons of England. The leader of the Ancients was Laurence Dermott, who published the *Ahiman Rezon, or Book of Constitutions*, virtually a copy of the constitutions of the original Grand Lodge of England. This he addressed to the Ancient York Masons of England. The Dermott grand lodge was relatively the more active in propagating lodges abroad, and difference in its work explains some of the striking variations in lodges in various States in America.

Permanent Masonic union in England in 1813, under the Duke of Kent as Grand Master of the Ancients and the Duke of Sussex as Grand Master of the Moderns, forever laid the controversy. Masonic students and historians present evidence that the degree known as the holy royal arch was originally the second (or third) section of the master's degree; that it was cut off and expanded by the Ancients, and that at the reunion of 1813 it was adopted and authorized to be conferred on master Masons. In the United States, the Dominion of Canada, and the Maritime Provinces the royal arch degree is made the summit of the capitular rite of four degrees conferred on master Masons who may be elected to receive it.

In England the royal arch is conferred in chapters of royal arch Masons governed by a Supreme Grand Chapter. The mark master's degree, distinctively English, a detached ceremonial, is conferred on master Masons in mark lodges, governed by a Grand Lodge of Mark Masters; and the Order of the Temple, associated with Knight Templar traditions, is conferred in priories of Knights Templars, governed by a Great Priory.

There was never any connection between Freemasonry and Templary or Malta knighthood, other than in Masonic legends which told of the Crusaders, after their return from Palestine, taking refuge among Masons and bequeathing their rites to the latter. This idea was fostered in an address in 1737 by Chevalier Ramsey, a Scotchman who became a Mason at London in 1728. This was the period in which degree making was rampant and Templar and Malta chivalric grades were common in the French, Scottish, and other systems. The old Baldwyn Encampment degrees at Bristol, long called the basis of the English Templar degrees, have not been traced back of 1779. By 1745 Masonic Templary, originating in the fertile minds of Masonic degree makers and dressed in the historical atmosphere of Knights of the Temple and Malta, ran across Europe and, through English and Irish Grand Lodge influence, into the American colonies. These degrees have ever been among the most popular in all rites into which adopted. This is partly explained by their trinitarian Christian character. As none but professing Christians among royal arch Masons are eligible, these degrees naturally fill a want left after English symbolic Masonry, which was originally trinitarian Christian, became unitarian and cosmopolitan. There are only about 6500 Knight Templars in the United Kingdom and Ireland.

The English Masonic menu also includes the Ancient Accepted Scottish rite degrees, which are under the administration of a Supreme Council and may be conferred on master Masons. In Scotland the statutes and ordinances of the Mason craft at the close of the sixteenth century, as outlined by William Shaw, general warden and his Majesty's master of work, were concerned mostly with trade relations. There was a password, but no degree or ceremonial. In 1736, through the efforts begun by Desaguliers 15 years before, various Scottish Mason lodges were interested and a Grand Lodge of symbolical Masons for Scotland, as well as provincial grand lodges, were formed. A gradual affiliation of remaining Scottish Mason lodges followed. Symbolic Freemasonry was introduced from England into Ireland in 1730. It met with some opposition from the Roman Catholic church, but the fraternity there expanded proportionately compared with elsewhere.

The first Masonic lodge in France was established at Dunkirk in 1721. It had an English charter, as, for that matter, did the first lodges in Spain, Germany, Netherlands, Austria, Greece, Turkey, Russia, Italy, Portugal, India, China, South Africa, Japan, and the American Colonies. The second French lodge was established at Paris in 1725. It also was of English origin, but fell under the ban of the Church and became social rather than Masonic in its aims. A Grand Lodge for France was formed in 1736, after which the strength of the fraternity there was marked with a riot of activity in the creation of new degrees and rites, most of which soon fell into disuse. In 1766 a National Grand Lodge of France was formed, since 1772 called the Grand Orient. Antagonism between the original Grand Lodge and the Grand Orient brought confusion, the latter using some superimposed Scottish rite degrees with the three symbolic degrees from England, while the earlier grand body was carried off for a time by the mystical creations of the notorious Cagliostro. With the revolution of 1793 both these grand bodies suspended, but in 1799 they were revived and united as the sole governing Masonic body in France. Then came another war of rituals between the Scottish philosophical and the new Ancient Accepted Scottish rite, imported as a novelty from the United States, and the fraternity in France was rent again. Union of the Grand Orient and the newly formed Supreme Council followed in 1804, when the American-created Scottish rite of 33 degrees was officially introduced, the two grand bodies sharing in its administration. The Grand Orient, it was claimed, broke the concordat in 1814, and assumed control of all the Scottish rite degrees, which brought on war with the Supreme Council. Political conditions owing to Bonapartist membership rendered the Supreme Council dormant until 1821, when it placed the first three degrees under dominance of a Grand Lodge of France, a Scottish rite protégé. The Grand Orient, having removed the name of the Deity from its lectures and the Bible from its altars, is not recognized by Masonic grand bodies which hold to the ancient landmarks.

Between 1725 and 1775 scores of so-called higher Masonic degrees were invented, some grouped into systems or rites. Many of these were hawked about the Continent by charlatans and others, in some instances as a means of livelihood. It was in France, too, that the earlier "Scottish" degrees were invented, so called to secure a distant birthplace where there were immemorial Masonic lodges. These degrees, 25 of them, "made in France," were first systematized in 1754, at Paris, by the Chevalier Bonneville, and called the Rite of Perfection. The only thing Scottish about them was the legends attributing their origin to Scotland. Some of the partisans of the Stuarts are reputed to have been members of this rite, which also lent color to the Scottish legend. In 1758 a Council of Emperors of the East and West at Paris succeeded to the title to this Rite of Perfection of 25 degrees, and in 1761 granted a patent to Stephen Morin to introduce the rite into the West Indies. In 1772 the Council of Emperors merged with a faction of the Grand Orient of France (which controlled the three symbolic English degrees), and as the factional Grand Lodge died within a few months the Rite of Perfection dropped out of sight in France. In 1779 the Grand Orient announced its control of Masonic degrees as extending only to the first three degrees. In 1786 the Grand Orient promulgated the French rite of seven degrees, four superimposed on the three which the English Grand Lodge gave to the world. The importance of this lies in pointing out Morin's authority to disseminate the Ancient and Accepted Scottish rite, or Rite of Perfection, which he carried to America, where it was developed into a rite of 33 degrees at Charleston, S. C., in 1801. From here it went to all parts of the globe, being for many years unrecognized as an American off-

spring of the French so-called Rite of Perfection, the rite *Ecossais*, or Scottish rite, amplified and adorned. It is to-day found virtually in every country where Masonry flourishes. Where the English rite of three degrees exists, the Scottish rite, governed by supreme councils, confers degrees only from the fourth to the thirty-third.

Freemasonry was introduced into America in 1730 by the Grand Lodge of England, when Daniel Coxe of New Jersey was made Provincial Grand Master for Pennsylvania, New Jersey, and New York. St. John's Lodge in Philadelphia was chartered by Coxe in the latter part of 1730 or in 1731. Benjamin Franklin's account books show that he sold stationery to that lodge in 1731. Franklin himself became a Mason in that year. St. John's Lodge of Boston was granted a warrant in 1733 by Major Henry Price, who had been made Provincial Grand Master in England in that year. Traveling military lodges attached to the British army in the Colonies helped to spread Freemasonry throughout the New World. After the Revolution colonial lodges formed grand lodges of their own, to which they transferred their allegiance. Subordinate lodges were established by the Grand Lodge of England at Savannah, Ga., Charleston, S. C., and Wilmington, N. C., about 1730–37, and it was not until 20 years later that successors to Daniel Coxe established a lodge at New York City.

There have been scores of Masonic rites, all drawing their initiates from possessors of the first three symbolic (English) degrees of entered apprentice, fellowcraft, and master Mason, but only five of any great consequence survive. The English rite consists of the first three degrees "including the holy royal arch." The second, or American rite, beginning with the first three degrees conferred in lodges, continues (if desired) with four degrees, mark master, past master, most excellent master, and royal arch Mason, conferred in chapters; the (optional) three degrees, royal master, select master, and superexcellent master, conferred in councils; and, finally, three orders, or grades, Companion of the Red Cross, Knight Templar, and Knight of St. John and Malta, conferred in commanderies of Knights Templar. Each of the latter groups, chapters, councils, and commanderies, has a separate government under a grand or State body, and these are subsidiary each to a single general grand, or national, body. In this respect they differ from the lodges which form the basis of the whole Masonic system in that the Grand Lodge in each State forms a sovereign jurisdiction. The French rite consists of the three English degrees (as do all rites), to which have been added four degrees selected from among those most popular in France among the many unsystematized inventions which appeared in the latter half of the eighteenth century. The rite in use by most German lodges, having its sanction in the Grand Lodge of the Three Globes, adds to the three symbolic degrees, seven degrees drawn from Scottish rite sources and the Templar theory of the origin of masonry.

The Swedish rite (practiced in Norway and Sweden) mixes the English and French systems. The Rite of Memphis (Egyptian) was constructed from the Rite of Misraim, founded at Milan in 1805, with 90 degrees, Scottish and other available floating material, to rival the Ancient Accepted Scottish rite, into which its founders had been denied admission. After a stormy career in France it became almost dormant in 1822. In 1839 the Rite of Memphis with 96 degrees and a ninety-seventh for its official head was framed at Paris out of the disintegrating finery of the Rite of Misraim, and soon sprang into life at Marseilles and Brussels. It disappeared by 1862, in which year an American carried the rite to New York, some accounts placing its transplanting eight or ten years earlier. The rite found place in England and nominally in a number of the United States, but was never active and had comparatively few members. Abroad it was chiefly useful to enable degree-peddling Masons, regular or irregular, to establish alleged "Scottish" rite grand bodies from which to peddle alleged Masonic lodge warrants to the uninformed in the United States and other countries.

The mission of Stephen Morin to the West Indies in 1761 resulted in his making a number of Scottish rite Masons of 25 degrees, who brought the rite into the Colonies—to Albany in 1767, to Philadelphia in 1781, and to Charleston in 1783. At the latter city in 1801 was created a new Ancient Accepted Scottish rite of 33 degrees. It confers, where the English three degrees exist, from the fourth to the fourteenth degrees in lodges of perfection, fifteenth and sixteenth in councils of Princes of Jerusalem, seventeenth and eighteenth in chapters of Rose Croix; nineteenth to thirty-second inclusive in consistories of Princes of the Royal Secret, and the thirty-third and last degree, that of sovereign grand inspector general, in supreme councils, of which there was to be one in each country where the rite existed, except in the United States, where there were to be two.

The "new" rite speedily went to France, where, strangely, it was welcomed as a discovery. By 1806 it had reached New York. The Mother Supreme Council of the World, formed at Charleston, now impressively housed in a temple at Washington, is known as the Supreme Council, A. A. S. R., U. S. A., Southern Jurisdiction. The Supreme Council for the Northern Jurisdiction was created at New York in 1813, with Daniel D. Tompkins, afterward Vice President of the United States, "in the Grand East." It is now established at Boston. The march of this rite throughout the world has been continuous. In the United States its growth has outrun that anywhere else, but not without years of controversy over regularity and right of control by rival Scottish rite governing bodies which ended in the reunion of 1867.

Two other Scottish rite bodies maintain a nominal existence in the United States. Each has a complete organization on paper, but with a relatively moderate following. The leaders in these two bodies doubtless believe they are the

ANCIENT, ACCEPTED SCOTTISH RITE MEMBERSHIP

	Southern Masonic Jurisdiction United States	Northern Masonic Jurisdiction United States
Number of active 33° members .	25	44
Number of emeritus 33° members	5	3
Number of honorary 33° members	847	1,085
Number of 32° members	56,162	79,007
Number of consistories established	92	46

real, hereditary proprietors of the rite here, but the referendum to the more than a million and a half master Masons in America does not agree with that view. Statistics of membership of the rite in the Southern and the Northern jurisdictions, 1913 and 1914 respectively, which include most of the prominent official and other representatives of the symbolic lodges and grand bodies and enjoy great material prosperity, are given in the table on the preceding page. No figures are given out by either of the other Scottish rite bodies referred to.

In the United States and most other English-speaking countries charity and protective features of the fraternity have shown themselves in the establishment of Masonic homes, orphanages, and schools for the care of dependent aged Masons and for widows and children of members. Chicago and Utica, N. Y., have very large institutions of this character. Others, including the earliest in the United States, that established at Louisville, Ky., in 1867, are the home at Philadelphia, and those at St. Louis, Mo., Richmond, Va., Burlington, N. J., Nashville, Tenn., and Wichita, Kans. These are supported by per capita taxes levied through the grand lodges and by voluntary contributions.

The Ancient Arabic Order of Nobles of the Mystic Shrine is the principal playground of American Freemasonry. It was founded at New York in 1871, the joint product of Dr. Walter M. Fleming, William J. Florence, the actor, and Prof. A. L. Rawson. It contains a legend as to an Arabic origin, and on its altars rest copies of the Bible and the Koran. Those closest to its beginnings have said that Florence conceived of it and set the stage, that Rawson, the Orientalist, wrote the ritual, and that Dr. Fleming introduced it. Only Masonic Knights Templars or thirty-second-degree members of the Scottish rite are eligible as members of "the Shrine" to wear its fez, claws, scimitar and star, which is apparently the ambition of so many members of the craft. There are 137 Shrine temples in the United States, with a total of more than 200,000 members, "nobles" as they are called.

Other Masonic places for recreation, but open to master Masons, include the Veiled Prophets of the Enchanted Realm, formed at Utica, N. Y., in the latter part of the nineteenth century, with about 5000 members; the Independent International Order of Owls, St. Louis, 1890, with perhaps 4500 members, and the Tall Cedars of Lebanon, which, like the others, is found in several States and has perhaps 10,000 members.

The Royal Order of Scotland, one of the oldest continuous appendant orders of Freemasonry, was introduced into the United States in 1878. Its two degrees are conferred in a provincial Grand Lodge held in a room of the temple of the Scottish rite, Southern Jurisdiction, where the chair is ever kept vacant for the hereditary Grand Master. These lodges are opened annually in most English-speaking countries. Membership is restricted. Its own tradition says the order took its rise in the time of David I, King of Scotland; that it presents the sacrifice of the Messiah, whereupon the candidate goes into the world to search for the lost word. This alone should date the invention not earlier than the first half of the eighteenth century.

The Order of the Red Cross of Constantine, Masonic, is conferred in grand councils in the United Kingdom and in the United States. It is based on the story of the conversion to Christianity of Constantine the Great and his vision of the passion cross. This ceremonial is claimed to have been rescued from some of the more ambitious of those degrees which interested continental Europe between 1725 and 1760. Master Masons in the United States were made eligible to receive the order in 1897. Not more than 5000 members are believed to have been attained in America and fewer than half that in England. In the United States, Chicago and Philadelphia have been most interested in its ceremonials.

From the middle of the eighteenth century the craft has been patronized by English royalty and the nobility. The like was true in France under the Bourbons, the Bonapartes, and the Republic. In the United States, besides Washington, five signers of the Declaration of Independence—Benjamin Franklin, John Hancock, William Hooper, Philip Livingston, and Thomas Nelson, Jr.—were Masons, as were Generals Nathanael Greene, Richard Henry Lee, Israel Putnam, Francis Marion, Barons De Kalb and Steuben and Marquis de Lafayette, Gen. Joseph Warren, Paul Revere, and Brandt, the Mohawk, and Tecumseh, the Shawnee chief. Ten Presidents of the United States were Masons, if Fillmore, who recanted, be counted. In addition to Washington they were Jackson, Polk, Buchanan, Johnson, Garfield, McKinley, Roosevelt, and Taft.

The Sovereign College of Allied Masonic and Christian Degrees of America, Richmond, Va., is described by itself as a body of Masons which confers academic and ritualistic degrees for distinguished service to the craft. Little is known of it other than finding it on various lists of Masonic organizations. It quotes several well-known side or detached degrees, some from the era in which degree making and selling were popular, and which are now interesting chiefly as curios.

The Order of the Eastern Star, often referred to as a Masonic society to which women relatives of Masons are eligible, has no Masonic connection whatever, other than that its membership is confined to women, as described, and to master Masons who may care to join it. This mixed men-and-women order, made up of Masons, their wives, daughters, mothers, etc., was formed in 1868, has governing chapters in almost every State in the Union and nearly 350,000 members.

Negro Freemasonry in the United States is as legitimate in its origin as that which came to white men in America from the Grand Lodge of England, as they were both derived from the same source. At Boston in 1775, Prince Hall, a negro, and 14 other colored men were made Masons in an English army lodge at what is now Fort Independence. It has been conjectured that the English, knowing the whites would resent such a proceeding, initiated the negroes to enlist the aid of the latter. If so, the plan failed, for Prince Hall sided with and fought for the colonists. In 1784 the Grand Lodge of England granted a warrant to Prince Hall and associates constituting African Lodge 454. There never has been a difficulty over the social gulf between the black and white races at this action by the English Grand Lodge. The latter dropped African Lodge from its roster after the union of 1813. There is no affiliation or recognition between white and colored Freemasonry in the United States. The latter has, or recently

had, a National Grand Lodge, something the white Masons never had. Colored Freemasons number perhaps 200,000, with lodges and grand lodges in nearly half of the States of the Union. They have paralleled, too, the Royal Arch Chapter degrees with perhaps 10,000 members; Knight Templary ceremonials with, as claimed, about 5000 members; and have a number of Scottish rite bodies, derived by charter through a representative of the Supreme Council of France, and, as reported, 2000 or more thirty-second-degree members.

Anti-Masonic sentiment has shown itself in three ways since the revival of Masonry in 1717. The first, continuous since 1724, comes from the Roman Catholic church; the second, attracting very little attention, from several offshoots of the Scotch Presbyterian church; while the third was shown for only about a decade following the disappearance from Batavia, N. Y., in 1827, of William Morgan, who had threatened to make public Masonic secrets.

In 1738 Pope Clement issued a bull against Freemasonry, enjoining temporal and spiritual communities against entering the society or spreading or defending its principles or admitting it to their houses under pain of excommunication. In the Latin American republics the church has continued, with the aid of successive papal bulls, to denounce Freemasonry and prohibit Catholics from joining not only the Masons but a few other secret societies to which many Masons belong. There is no rule or regulation in Masonry which could be construed as preventing a Roman Catholic from becoming a member, and the church's antagonism to the craft of late, particularly in France, Italy, and Spain, has been due perhaps to reported atheistic and antichurch tendencies among lodge members there, for part of which the latter have been cut off from affiliation with English-speaking bodies, and because of the general attitude of many Latin American grand lodges in antagonizing the church politically.

In 1757 the synod of Stirling debarred all adhering Freemasons from the ordinances of religion, and that attitude has been continued since by several factions of the Scotch church.

The disappearance of William Morgan, whom people imagined to have been thrown into Niagara River by the Masons, created a tremendous excitement which Thurlow Weed and William H. Seward and others turned to political advantage by pretending that a body found in the river had been recognized as Morgan's. Asked later as to the claim, Weed made the famous comment that it was a "good enough Morgan until after election." So great was the outcry at the time that lodges were abandoned right and left in the Eastern and Middle States, while many families, church members, and friends separated on the issue. An anti-Masonic party was formed, became for a few years practically the only opponent of the Democratic party, and in 1832 ran William Wirt for the presidency, who, with Clay, Republican candidate, was defeated by Andrew Jackson, a Freemason. (See ANTI-MASONS.) Freemasonry recovered slowly from the inquisition given it by the anti-Masonic party. During 10 years prior to the Civil War the craft in the United States fully recovered what it lost between 1828 and 1840 and has grown rapidly ever since the war ended.

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MASO'RA, MASSORAH, MASSORETH (Heb. tradition, from *māsar*, to hand over). A particular collection of critical notes on the text of the Old Testament, its divisions, accents, vowels, grammatical forms, letters, etc. According to the early mode of Semitic writing, only the consonants were indicated; hence in the course of time there inevitably arose a vast number of variants in the Old Testament text, or rather different ways of reading and interpreting the same letters by dividing them into different words with different vowels and accents. Some measures for the more accurate preservation of the documents became indispensable, and the desideratum was supplied by the Masora, which, by fixing an immutable reading upon each verse, word, and letter, put an end to the confusion and left the individual fancy free to take its own views for homiletical purposes only. The origin of the Masora is shrouded in mystery. The first certain traces of it are found in certain Halachistic works treating of the synagogue rolls of the Pentateuch and the mode of writing them, and it is reasonable to suppose that practical necessities called forth by the institution of readings from the Pentateuch and Prophets as a regular feature of religious services led to accurate determination of the text of each verse, the number of letters, and the pronunciation of each word, including the proper intonation. A late Talmudic treatise, *Massecheth Sopherim*, treats of these matters. Some of the earliest works on the subject have survived in their titles only, such as *The Book of the Crowns* and *The Book of the Sounds*. There can hardly be a doubt that the Masora, like the Halacha and Haggada, was the work, not of one age or century, but of many ages and centuries, as, indeed, we find in ancient authorities mention of different systems of accentuation used in Tiberias, Babylon (Assyria), and Palestine. In the period of Hadrian we learn of two scholars, Nakkai and Hammum, who are said to have counted the number of verses in the books of the Old Testament, but the systematic work of the Masoretes belongs to a much later period. The vowel system at present employed, which is their work, cannot be traced further back than c.700 A.D., and appears to be based on the example furnished by Syrian grammarians; but before this was perfected at Tiberias in Palestine another system, chiefly superlinear in character and much more complicated, was evolved and adopted in Babylonia. These two systems are distinguished as the Tiberian and the Babylonian respectively. It was in Tiberias that the Masora was first committed to writing. Monographs, memorial verses, finally glosses on the margins of the text, seem to have been the ear-

liest forms of the written Masora, which gradually expanded into one of the most elaborate and minute systems, laid down in the "Great Masora," made up of longer notes placed upon the upper and lower margins (about the eleventh century). Besides this there was compiled the "Small Masora," notes placed between the columns of the texts. A further distinction is made between Masora *textualis* and *finalis*, the former containing all the marginal notes; the latter, larger annotations, which, for want of space, had to be placed at the end of the paragraph. Of independent Masoretic works the most important is the one known as *Ochlah weochlah*. The final arrangement of the Masora, which was first printed in Bomberg's Rabbinical Bible (Venice, 1524–25), is due to Jacob ben Chayim ben Adonijah and to Felix Pratensis. The language of the Masora is Aramaic, and besides the difficulty of this idiom, the obscure abbreviations, contractions, symbolical signs, etc., with which the work abounds, render its study exceedingly difficult. An explanation of the Masora is found in Elias Levita, *Masoreth Ha-Masoreth* (translated into German by Semler, Halle, 1772; edited, with an English translation by Ginsburg, London, 1867), and Buxtorf, *Tiberias* (Basel, 1620). Consult also: C. T. Ginsburg, *The Massorah* (4 vols., London, 1880–1905); Harris, "Rise and Development of the Massorah," in the *Jewish Quarterly Review*, vol. i (ib., 1889); König, *Einleitung in das Alte Testament* (Leipzig, 1893); Cornely, *Introductio in V. T. Libros Sacros*, vol. i (Paris, 1894); Weir, *A Short History of the Hebrew Text of the Old Testament* (London, 1899); C. T. Ginsburg, *Introduction to the Hebrew Bible* (ib., 1899); S. R. Driver, *Notes on Hebrew Text of the Books of Samuel, with Introduction on Hebrew Palæography* (2d ed., Oxford, 1913).

MASÓ Y MARQUEZ, mȧ-sō′ ē mär′kȧth, Bartolomé (1834–1907). A Cuban patriot, born near Manzanillo and educated in France. He became a rich planter. At the outbreak of the Ten Years' War (1868–78), he joined the patriot army and rose to the rank of colonel. Cespedes made him Superintendent General of the Treasury and he was active in the service of the Republic under Estrada Palma. After the war he was arrested and imprisoned. From 1883 to 1895 he was again a prosperous planter near Manzanillo, and, in the latter year, was the first prominent Cuban to join the revolutionary movement started by José Martí (q.v.). He was chosen Vice President of the newly organized insurgent government (September, 1895) and in 1897 was elected President. In 1901 he was considered as the logical candidate for the vice presidency with Estrada Palma, but, being opposed to the Platt amendment, he finally came out as his opponent. Although he had a large following, he withdrew his candidacy before the date of the election, alleging that unfair methods were being used in the canvass.

MASPERO, mȧ′spe-rō′, Sir Gaston Camille Charles (1846–1916). A distinguished French Egyptologist. He was born in Paris, June 23, 1846, and received his early education at the Lycée Louis le Grand. At the age of 14 he studied the Egyptian language privately, and in 1865, when he entered the Ecole Normale, he had attained a high degree of proficiency in the interpretation of hieroglyphic texts. Two years later he published, with the approval of Mariette, his *Essai sur l'inscription dédicatoire du temple d'Abydos et la jeunesse de Sésostris*. In 1867 he went to Montevideo to coöperate with Vicente Fidel Lopez in his studies on the Indian dialects of Peru, translating into French and editing Lopez's work, *Les races aryennes de Pérou*. On his return to Paris, a year later, he resumed his Egyptological studies, and in 1869 he read before the Académie des Inscriptions a memoir on the Abbott Papyrus, containing an official report in regard to the tomb robberies in the Theban necropolis under Ramses IX. This memoir, under the title *Une enquête judiciaire à Thèbes au temps de la XXème dynastie*, was published at Paris in 1871. In 1869 Maspero became *répétiteur* in the department of Egyptology at the Ecole des Hautes Etudes, and three years later he passed the examination for the degree of doctor, presenting two theses: *De Carchemidis Oppidi Situ et Historia Antiquissima* and *Du genre épistolaire chez les Egyptiens de l'époque pharaonique*. In 1874 he was appointed professor of Egyptology in the Collège de France as the successor of E. de Rougé. In 1875 was published his *L'Histoire ancienne des peuples de l'Orient*, which was the first attempt to present, from monumental sources, the history of the ancient East as a whole, and to exhibit the relations existing in antiquity between the peoples of western Asia and the Nile valley. The eleventh edition of this work, which has been frequently revised, was published in 1912. In the course of the next five years Maspero wrote a number of valuable memoirs on Egyptian philology, history, and archæology, the most important being: "De quelques navigations des Egyptiens sur la mer Erythrée" (*Revue Historique*, 1878); "La grande inscription de Beni-Hassan" (*Recueil de Travaux*, 1878); "Récit de la campagne de Mageddo sous Thoutmès III" (*Recueil de Travaux*, 1879–80). He received the decoration of the Legion of Honor in 1879 and in 1882 was made an Officer of the Legion. In 1880 he was sent by the French government to Egypt at the head of the Mission Archéologique, which, under his skillful management, developed into a school for the prosecution of advanced studies in Egyptology and kindred subjects. In 1881 Maspero was appointed director of the excavations and antiquities of Egypt, succeeding Mariette, several of whose posthumous works he edited and whose biography he wrote in 1905. His excavations, though less extensive than those of his predecessor, were more methodical, and he is entitled to special credit for his successful efforts for the preservation and protection of the monuments of Egypt. In 1883 he became a member of the Académie des Inscriptions et Belles-Lettres. In June, 1886, leaving Grébaut as his successor in Egypt, he returned to Paris and resumed his chair at the Collège de France, assuming at the same time the direction of Egyptological studies in the Ecole des Hautes Etudes. In 1899 he returned to Egypt to resume the position which he had resigned in 1886, and he remained there until 1914, when his election as permanent secretary of the Académie des Inscriptions et Belles-Lettres brought him back to Paris. He received the English K. C. M. G. in 1909. Maspero's works are very numerous. In addition to those already mentioned, some of the most important are: *Hymne au Nil* (1868); *Etudes égyptiennes* (1879–91); *Les contes populaires de l'Egypte ancienne* (1882; 4th ed., 1911); *Mémoire sur*

quelques papyrus du Louvre (1883); *L'Archéologie égyptienne* (1887; Eng. trans. by Amelia B. Edwards as *Manual of Egyptian Archæology and Guide to the Study of Antiquities in Egypt;* also translated and enlarged by Agnes S. Johns, 6th Eng. ed., 1914); *Les momies royales de Deïr-el-Bahari* (1889); *Lectures historiques: Egypte et Assyrie anciennes* (1890; 6th ed., 1912); *Etudes de mythologie et d'archéologie égyptiennes* (1892 et seq.; vol. vii, 1912). Translations, edited by Sayce, were published as: *The Dawn of Civilization: Egypt and Chaldæa* (3d ed., 1897); *The Struggle of the Nations: Egypt, Syria, and Assyria* (1897); *The Passing of the Empires, 850–330* B.C. (1900). *A Complete History of Egypt* in twelve volumes appeared in 1904 et seq. Other works include: *Les contes populaires de l'Egypte ancienne* (3d ed., 1906); *Causeries d'Egypte* (1907; Eng. trans. by Elizabeth Lee, *New Light on Ancient Egypt*, 1909); *Egypt, Ancient Sites and Modern Scenes* (trans. by Lee, 1911); *Art in Egypt* (1912; appeared in United States, England, France, Germany, Italy, Spain); *Egyptian Art* (trans. by Lee, 1913). Maspero edited the valuable *Mémoires de la mission française au Caire* (1884 et seq.) and in 1879 assumed editorial direction of the *Recueil de travaux relatifs à la philologie et l'archéologie égyptiennes et assyriennes.* It was in this journal (vols. i–xiv) that he published the text and translation of the inscriptions engraved upon the walls of the pyramids of the fifth and sixth dynasties at Saqqara (q.v.). He also contributed frequently to the *Journal asiatique.* See EGYPTOLOGY.

MASQUE (Fr., mask), or **MASK.** A species of dramatic entertainment much in vogue in England in the sixteenth and seventeenth centuries, so named from the masks (see MASK) which were originally worn in it. It was introduced during the reign of Henry VIII in imitation of some of the Italian allegorical pageants of the period, and was at the same time a development of the festive processions of the city of London and of the royal progresses. Around the acted pageantry of the mythological and allegorical personages in these there grew up regular dramatic performances in which music and dancing were prominent and which were comparable to the *ballets* of the French court. (See BALLET.) Masques were in their time the favorite form of private theatricals, though the elaborate and expensive style in which they were usually given limited them for the most part to the homes of the nobility and the court. They were at their best in James I's day. Ben Jonson, above all, made the masque a thing of literary beauty, in which his classic learning and graceful fancy united to furnish royal amusement. As spectacles, masques were largely an affair of costume and of scenic design, to which the architect Inigo Jones lent his aid. The taste for this style of entertainment died away under Charles I; yet to his time belongs Milton's *Comus.* In this, however, though it was made to be acted, the masque has become a literary form practically independent of actual presentation, and as such it has survived to our day.

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MASQUERADE más′ke-rād′ (Fr., from Sp., Portug. *mascarada,* masquerade, from *mascara,* mask). The disguise effected by wearing a mask or strange apparel, or the assembly itself of persons masked and disguised with fantastic dress. In early times the masquerade often accompanied religious observances; it was a feature of the Greek Bacchanalia and the Roman Saturnalia, and fantastic costume, at least, is known to have been worn at the Jewish feast of Purim. The Druids when proclaiming the New Year (q.v.) masked and disguised in women's robes, the skins of beasts, etc. During the Middle Ages masquerades characterized by great frivolity and extravagance were held in the churches in spite of the attempts of the Fathers to do away with them. Even the priests took part in them. Of this nature were the feast of fools (q.v.) and other burlesquing festivals, recalling the heathen Saturnalia. They bore different names in different countries and were continued until the sixteenth century. Such was probably the origin of the masked ball, an exclusive form of masquerade which was introduced into the French court by Catharine de' Medici. It found its way to England in the reign of Henry VIII, but did not reach any of the courts of Germany till the end of the seventeenth century. The *bal costumé* is a very modified and much less objectionable form of the masquerade. During the carnival public masquerades are held in all the theatres and dancing saloons of Paris, and processions of maskers pass through the streets playing mad pranks. See CARNIVAL; GREEK FESTIVALS.

MASS. The name given among Catholics to the Eucharist or Lord's Supper (q.v.), considered as the highest form of Christian worship, as a sacrifice, and the offering of the body and blood of Jesus Christ under the forms of bread and wine. The proofs adduced to show its institution under this aspect at the Last Supper are the words employed on that occasion; the teaching of St. Paul and of the Fathers of the Church; the practice of the Apostles; the unbroken tradition of all Christendom for 16 centuries; and its retention as a sacrifice in the Eastern churches which separated from Catholic unity. The prophecy of Malachi (i, 11) is likewise regarded as foretelling it. The teaching of Roman Catholic theologians is that in the Eucharist Christ is "as it were slain." He is not merely present, but is in a state which is a kind of death. He is there with all the perfections of his godhead, and all the complete nature, functions, and glory of his manhood; all, in fact, that he is in heaven; but he does not manifest it; nor does he exercise his powers in the Sacrament as he does in heaven. How much or how little his human senses are exerted is still a matter of discussion among theologians. This sacramented condition of Christ is evidently the greatest conceivable way of expressing subjection to God's dominion, of impetrating, atoning, and rendering thanks, the four objects which are considered to be the purposes of the Sacrifice of

the Mass. Necessarily it supposes transubstantiation (q.v.) and the priestly power. Accordingly it can only be offered by one who is in priest's orders. By the law of the church he must be fasting, absolutely, from the midnight previous to the celebration of the mass. It is offered in the morning, though this time may be extended, for reasons legislated upon, to a limited time after midday. Each priest is permitted to offer it once a day; though on Christmas Day he may offer three masses, and in some countries two on All Souls' Day. In some countries where there is a lack of priests it is permitted to celebrate mass twice on Sundays; otherwise the people would not be able to fulfill the obligation which is incumbent upon them of assisting at mass on Sundays and certain great festivals. (See COMMANDMENTS OF THE CHURCH.) Absence from this public worship on Sundays and certain feasts without sufficient reason is held to be a grievous sin.

The priest who celebrates always communicates. This is for the integrity of the sacrifice; but the essence of the sacrifice is by many taught to be in the consecration. Whether some or none of the congregation communicate does not affect the sacrifice; the rule is, however, that some one must be present to make the responses. (For the teaching and details as to communion, see SACRAMENT; COMMUNION IN BOTH KINDS.) The bread must be wheaten bread; the wine, wine of the grape. In the Eastern church leavened, in the Western unleavened, bread is used. The time of the introduction of unleavened bread in the West is not certain.

Private masses are said in a low tone, and hence called low masses. Those which are sung are called high masses, and if the celebrant is assisted by other ministers the mass is said to be solemn; if the celebrant is a bishop it is pontifical. Those celebrated for the dead are called, from the first word of the introit, requiems; and the mass at the celebration of marriage is called a nuptial mass. As saints are honored on almost every day of the liturgical year, prayers in which their intercession is invoked are introduced at the beginning and at the end of the service, and also in the part which the priest recites in a tone audible only to himself, and hence called the Secret.

There are certain days not devoted to the commemoration of any mystery or saint, and the priest is permitted to choose one in whose honor he may celebrate according to his devotion; these are termed votive masses. There is no such thing as *dry mass;* the expression is used to denote the going through, by one who is preparing for the priesthood, of the various prayers and ceremonies in order to familiarize himself with them. The "mass of the presanctified," used on Good Friday (see HOLY WEEK), is not a complete mass, lacking the consecration.

The use of an unchanging language like Latin and some Oriental languages is intended to be a safeguard against new meanings that grow into words in the use of living tongues. It is not necessary, on the theory here explained, that the words should be understood or even heard in detail by the congregation any more than it was necessary for the Jews to enter the sanctuary where the sacrifice was being offered. They understand that they are taking part in the supreme act of worship, though even the assistant at the priest's side may not be able to hear the words of consecration.

For the vestments used in the mass, see COSTUME, ECCLESIASTICAL; and for the early development of liturgical structure, see LITURGY. The mass is divided into two main parts, known from ancient analogy as *missa catechumenorum* and *missa fidelium,* the latter or more sacred part having been originally that from which the unbaptized were excluded. (See DISCIPLINA ARCANI.) A similar distinction, though not identical, is made between the Pro-Anaphora and Anaphora of the Greek liturgies. The first consists of the celebrant's preparation at the foot of the altar, introit, *Kyrie eleison, Gloria,* collect, epistle and gospel, and creed. The second begins with the offertory or oblation of the elements; the preface leads up to the *Sanctus,* and then follow the canon or practically unvarying central portion of the mass (including the consecration) and its accompanying prayers, the communion, and the postcommunion; the congregation is dismissed with the ancient formula *Ite missa est,* from which the mass derives its name (Lat. *missa*). See the articles on all the more important parts of the service named above.

The musical history connected with the mass is of considerable importance, as the early development of polyphonic music was almost exclusively along the lines of sacred use. Originally the whole service, when sung, was set to plain chant (q.v.); but later the *Kyrie, Gloria, Credo, Sanctus,* and *Agnus Dei* were detached and set to new music, these numbers constituting what is called a mass in the musical sense. The masses of the composers of the Gallo-Belgic school of the fifteenth century had become so complicated and overloaded with contrapuntal tricks that a desire for a simple and more dignified style was created. Palestrina inaugurated the new epoch in writing distinguished by grandeur and majesty; his compositions were usually for four to eight voices. The great masters of the seventeenth and eighteenth centuries wrote masses for eight, twelve, sixteen, twenty-four, and sometimes even more voices. All these works were written *a cappella,* without instrumental accompaniment. The development of instrumental music suggested new combinations, and the *missa solemnis* of Bach and Beethoven thus grew up. Gounod, Silas, and Widor have given notable examples of this style in more recent times. See SACRED MUSIC.

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MASS. See MATTER.

MASSA, mäs'sà. The capital of the Province of Massa e Carrara, Italy, on a hill rising from the banks of the Frigido, 3 miles from its outlet in the Gulf of Genoa and 26 miles north of Pisa (Map: Italy, C 2). Its chief buildings are the ducal palace, now the prefecture building, a former summer residence of Elisa Bacciocchi, Napoleon's sister. Its institutions include a Gymnasium, lyceum, technical school, and art

school. Massa has fine marble quarries, which are extensively worked, and important manufactures of silk, paper, and olive oil. It was formerly the capital of a principality and later of the Duchy of Massa-Carrara, which was united with Modena in 1829. It is jointly with Carrara the seat of a bishop. Pop. (commune), 1901, 26,413; 1911, 30,830.

MAS'SACHU'SET (at the great hills, i.e., the Blue Hills of Milton). An important Algonquian confederacy formerly occupying the territory about Massachusetts Bay, and extending along the coast from Plymouth northward to about Salem, including the basins of the Neponset and Charles rivers. Their principal village, from which they took their name, was on the site of Quincy, in Norfolk County. Before the coming of the whites they seem to have held the leading place among the tribes of southern New England, and are said on good authority to have had over 20 villages in 1614. They suffered more than any other tribe from the great pestilence of 1617, and when the English arrived a few years later they found the Massachusets reduced to a mere handful and most of the villages depopulated. In 1631 they numbered only about 500, and two years later were still further reduced by smallpox, which carried off their chief, Chickatabot. In 1646 they were gathered, with other converts, into the mission villages of Natick, Nonantum, and Ponkapog, and ceased to have a separate tribal existence.

MAS'SACHU'SETTS. A North Atlantic State of the American Union, belonging to the New England group. Except the eastern part, which expands along the ocean front, Massachusetts resembles generally a parallelogram and lies approximately between lat. 42° and 42° 43′ N. It is bounded on the north by the States of Vermont and New Hampshire, on the west by New York, on the south by Connecticut and Rhode Island and the Atlantic Ocean, and on the east by the Atlantic Ocean. Its greatest length is 184 miles; the distance from Cape Ann due west to the New York State line, 138 miles; the extreme width is 113¾ miles, and the average width in the west 47¾ miles. The total area is 8266 square miles, of which the water surface amounts to 227 square miles. The irregular coast line gives an ocean frontage of nearly 300 miles, excluding the shore lines of the islands and lesser inlets. There are three great bays—Cape Cod Bay, Massachusetts Bay, and Buzzards Bay.

Topography. Massachusetts, a part of the upland or uplifted peneplain of southern New England which slopes from the local representatives of the Appalachian Mountains southeastward to the sea, may be divided into four physiographic provinces. 1. In the extreme west, extending north and south across the State, the Berkshire Hills (from Berkshire County) are a continuation of the Green Mountains of Vermont, and are composed of a number of ranges and minor valleys. The Taconic Range attains an extreme elevation of 3535 feet in Greylock or Saddle Mountain, near the northern boundary—the highest elevation in Massachusetts. The altitude falls away slightly to the south, where Mount Washington or Everett, in the southwest corner of the State, rises to a height of 2624 feet. The Hoosac Range has a somewhat regular altitude of 1200 to 1600 feet, reaching its maximum in Spruce Hill—2588 feet. The Housatonic valley has an elevation of 1100 feet at its north end and falls to 800 in the south. East of these ranges to the Connecticut the slope is southeast and is deeply cut by rivers. 2. The Connecticut valley, the second province, a broad flood plain, running from the Vermont-New Hampshire line and extending into Connecticut, has been cut out of the upland because of the presence of a less resistant rock than is found to the east or the west. The trap ridges, so conspicuous in the State of Connecticut from Long Island Sound up, are represented in the valley by Mount Tom, with an altitude of 1214 feet, Mount Holyoke, 955 feet, and others which rise as isolated peaks above the surrounding low country but do not extend above the upland level. 3. The country on the east side of the Connecticut River is a dissected plateau, with an elevation of about 1100 feet at the middle of the State, the surface sloping gradually eastward. Upon the old Cretaceous base level, which forms the top of most of the hills, some older hills stand out as monadnocks, the most conspicuous of which is Wachusett Mountain, 2108 feet in height. 4. In the eastern section the country is generally level or undulating. This lowland continues southeastward into the Cape Cod peninsula, extending in the form of an arm bent at the elbow for a distance of 65 miles, 35 miles eastward and a nearly equal distance northward, curving slightly westward at the extremity. Near this southern projection of the State lie many islands similar in character to the Cape Cod peninsula—Marthas Vineyard, the 16 Elizabeth Islands, and Nantucket Island.

Hydrography. The rivers of Massachusetts are numerous, but unimportant for purposes of navigation. The Connecticut traverses the State from north to south. It varies in width from 450 feet to 100 feet, but its flow is broken by falls at various points. On its western side it receives the Deerfield and Westfield, and from the east Millers River and the Chicopee. Though navigable for small craft it is chiefly important for its water power and for floating logs from the forests near its headwaters. Between the Taconic and the Hoosac Mountains flow north and south, respectively, the Hoosac and Housatonic rivers, the former discharging into the Hudson, the latter into Long Island Sound. The valleys of the Connecticut and its branches and the Housatonic are noted for their picturesque scenery. Descending from New Hampshire, the Merrimac flows for 35 miles through the northeastern corner of the State, discharging into the Atlantic Ocean. It is navigable for small craft as far as Haverhill, 15 miles from its mouth, but is valuable especially for its water power. Other rivers important also chiefly for their water power are the Concord, emptying into the Merrimac at Lowell; the Charles, discharging into Massachusetts Bay at Boston; and the Blackstone and the Taunton, flowing south into Narragansett Bay. The courses of the rivers are marked by broad reaches and sudden declines, instead of uniform gradients. Very many small glacial lakes are scattered over the State, especially near Cape Cod. There are excellent harbors at Fall River, New Bedford, Provincetown, Plymouth, Boston, Lynn, Marblehead, Salem, Gloucester, and Newburyport. Boston harbor is the most important harbor in the State. It is protected from the severe northeast storms by drumlins which have been partly submerged and tied to the mainland by spits, but the small basin formed thereby acts as a catch-

ment for the sediment brought down by the rivers. South of Boston the inlets are all of the "hook spit" type, a prominent feature along this part of the coast; but only the harbor of Provincetown is deep enough to accommodate the largest ocean ships. Buzzards Bay, the third largest indentation of the State, extends 30 miles inland to the west of Cape Cod, and contains New Bedford and Wareham harbors. The former is one of the most important havens in the State.

Climate. Massachusetts lies in the middle of the north temperate zone, yet, because of its proximity to the paths of the cyclonic and anticyclonic disturbances, it is strongly influenced by the north winds of winter and by the west and southwest winds of summer, bringing respectively the cold waves and the hot continental air to the coast. The average temperature for January is between 25° F. and 30° F., and for July about 70° F. In Boston the highest temperature ever recorded is 104° F. and the lowest, 13° below zero F. Inland the winter extreme especially is frequently exceeded. There is an average annual precipitation of 40 inches and over, very evenly distributed through the year. The snowfall is rather heavy, ranging from 30 inches at the south coast to 60 inches in the northwestern counties. The average annual relative humidity ranges from 80 per cent on the islands at the southeast to less than 70 per cent in the northwestern counties. The islands of Marthas Vineyard and Nantucket have an average wind velocity for the year of 14 miles per hour, the highest average recorded in the United States. The normal wind direction for January is northwest, and for July is southwest.

Soil. The soil of the State is largely the result of glacial erosion and deposition. The harder ridges, overridden by the ice, were denuded of all soil; the débris of the granitic hills is too coarse and too new to invite cultivation.

The Triassic valley of the Connecticut River gives flat lands of exceeding fertility, while river and lake deposits of worked-over glacial till furnish many alluvial plains of very rich land, but of limited area.

Many glacial lakes are partly filled and are utilized as cranberry marshes.

Geology. Massachusetts has a very complex geological history. At the beginning of Cambrian time three mountain masses of granitic rock extended across the State to the northeast, alternating with arms of the sea. Cambrian and Ordovician strata were deposited on the shore of the Champlain channel, west of Hoosac Mountain; in a narrow gulf, which extended from Gaspé Point to Worcester; and in a trough extending from western Rhode Island via Portsmouth to the Bay of Fundy. The Hoosac Mountain and its continuation in the Green Mountains represent the axis of the Appalachian mountain making in New England, and the older Paleozoic clastics to the west were very strongly metamorphosed—the limestones into marbles, the muds and gravels into slates and schists, and some of the sandstones into quartzites. In Carboniferous time the whole State had been worn down to base level, and coal measures were deposited in the Rhode Island-Nova Scotia basin and in the Gaspé-Worcester trough. In Triassic time there was an estuary in the Connecticut River valley extending to the north boundary of the State, with an average of 20 miles in width. This estuary was gradually filled with sandstones, and during their formation there were great outflows of trap rock. In the later Cretaceous all New England was reduced to base level, the southeastern margin of Massachusetts being under a shallow sea, receiving deposits of clays, as at Gay Head in Marthas Vineyard. The State was involved in the uplift of the Appalachian region at the close of the Cretaceous, and was raised into a plateau of moderate elevation. Massachusetts shared with the whole of New England in the denudation and erosion of the Pleistocene glaciation. The ice moved southward and southeastward across the State, discharging into the sea beyond Nantucket and Long Island and by deposition of its débris giving reality as well as form to Nantucket, Marthas Vineyard, and Cape Cod. It strongly accentuated the southward-trending valleys, while the higher ridges were denuded of soil, and the ice, on receding to the north, left the State strewn with a mantle of drift.

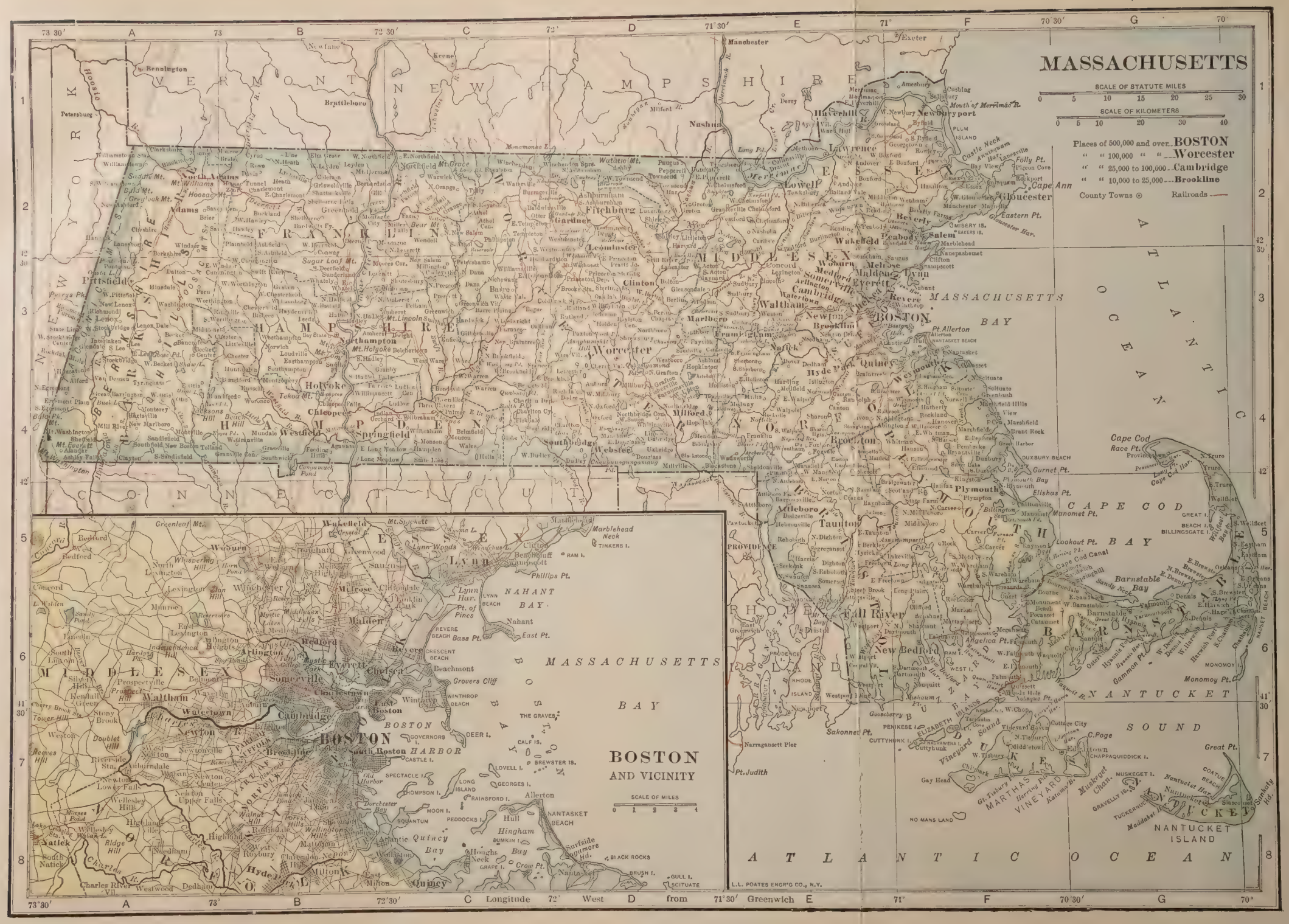
Mineral Production. Quarry products and clay are the chief mineral products. Measured by value, about 60 per cent of the stone quarried is granite, which is used chiefly for building and monumental purposes. The quarrying of trap rock is next to that of granite in the value of the output, Massachusetts being one of the half-dozen States in which the production of trap rock is an important industry. The total value of stone produced in 1913 was $4,096,372. Massachusetts was for many years the largest producer of granite in the United States, but is now surpassed by Maine and Vermont.

The chief clay products are common brick and brick for stove lining. The lime-burning industry is located in Berkshire County and is carried on independently of the marble-quarrying operations. The production of lime in 1913 was 130,365 tons, valued at $683,541. The production of sand and gravel in 1913 amounted to 290,757 short tone, valued at $149,036. In addition to the above, emery, fuller's earth, gems, infusorial earth, quartz, sand-lime brick, and talc are produced. The total value of all minerals produced in 1913 was $7,044,529.

Agriculture. Of an approximate land area of 5,144,960 acres in 1910, 2,875,941 acres were in farms, which numbered 36,917. Improved land in farms in 1910 was 1,164,501 acres. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, in 1910, was $226,474,025. The average value of all property per farm was $6135 in 1910, while the average value of land per acre was $36.69. The number of farms operated by owners and managers, in 1910, was 33,938. The native white farmers in 1910 numbered 28,431, the foreign-born white farmers 8362, and the negro and other non-whites 124. Of the foreign-born white farmers the greater number came from Canada.

The table on page 205 gives the acreage, production, and value of the principal crops in 1914. The figures are estimates of the United States Department of Agriculture.

The total value of crops in 1909 was $31,948,000 and the combined acreage of crops for which acreage was reported was 654,844, representing 56.2 per cent of the total improved land in farms. The general character of agriculture is indicated by the fact that only 5.1 per cent of the total value of crops in 1909 was contributed by the cereals, while over one-third was con-


MASSACHUSETTS
SCALE OF STATUTE MILES
0 5 10 15 20 25 30
SCALE OF KILOMETERS
0 5 10 20 30 40
Places of 500,000 and over...BOSTON
" " 100,000 " "...Worcester
" " 25,000 to 100,000...Cambridge
" " 10,000 to 25,000...Brookline
County Towns ⊙ Railroads
VERMONT
NEW HAMPSHIRE
NEW YORK
CONNECTICUT
RHODE ISLAND
MASSACHUSETTS BAY
ATLANTIC OCEAN
CAPE COD BAY
NANTUCKET SOUND
NANTUCKET ISLAND
MARTHAS VINEYARD
BOSTON AND VICINITY
SCALE OF MILES
0 1 2 3 4
BOSTON HARBOR
NAHANT BAY
L.L. POATES ENGR'G CO., N.Y.
Longitude 72° West from Greenwich

tributed by hay and forage and one-fourth by potatoes and other vegetables. In 1909, the production of hay and forage was 831,955 tons, valued at $11,280,989, with an acreage of 519,503. The total acreage of potatoes and other vegetables in 1909 was 61,686 and their value

PRODUCTS	Acreage	Prod. bu.	Value
Corn	48,000	2,256,000	$1,918,000
Oats	9,000	333,000	186,000
Rye	3,000	57,000	58,000
Potatoes	27,000	4,185,000	2,971,000
Hay	480,000	*634,000	13,631,000
Tobacco	6,600	†11,550	2,044,000

* Tons. † Pounds.

$8,184,000. Excluding potatoes and sweet potatoes, the acreage of vegetables was 37,220, valued at $6,190,000. Tobacco had an acreage of 5521 in that year, and the production amounted to 9,549,306 pounds, valued at $1,218,060. The total value of orchard fruits in 1909 was $2,074,270, there being produced 2,763,679 bushels. The most important of these fruits are apples, of which 2,550,259 bushels, valued at $1,780,290, were grown in 1909. Other important orchard fruits are peaches and nectarines, pears, plums, and prunes. The most important of the small fruits are cranberries, which are grown chiefly in the marshy lands of Barnstable and Plymouth counties. The acreage devoted to this fruit in 1909 was 6577. There were produced 22,714,496 quarts, valued at $1,062,205. Next in point of value were strawberries. Other small fruits grown in important quantities are blackberries, dewberries, raspberries, loganberries, and currants. The total quantity of small fruits produced in 1909 was 29,260,143 quarts, valued at $1,676,790. The grapes produced in 1909 amounted to 1,132,838 pounds, valued at $30,858.

Tobacco has been raised in the valley of the Connecticut River since earliest Colonial days. In the growing of flowers and plants Massachusetts is one of the most important States. The value of the flowers and plants grown in 1909 was $2,455,467. The value of the maple sugar and maple sirup produced in the State in 1909 was $77,559.

Live Stock and Dairy Products. As in other New England States, stock raising has suffered from the effects of Western competition. The development of intensive farming has necessitated an increase in the number of horses, and the rapid growth of the dairying industry has resulted in a gain in the number of dairy cows. The total value of live stock on the farms of the State in 1910 was $19,208,712. There were 252,416 cattle, valued at $9,348,076. On Jan. 1, 1915, the number of cattle other than milch cows was estimated at 83,000, with a value of $2,083,000; milch cows, 157,000, valued at $10,362,000; horses, 64,000, valued at $9,920,000; sheep, 30,000, valued at $168,000; swine, 108,000, valued at $1,674,000. The total value of fowls of all kinds in 1910 was $1,492,961. The value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $15,187,774. There were sold 64,496,692 gallons of milk, valued at $13,297,634, and 2,220,311 pounds of butter, valued at $696,336.

Fisheries. The Massachusetts Bay Colony early recognized fishing as one of the leading industries, in fact, second only to farming. Special legislation was adopted whereby the fisheries were exempt from taxation, and ship carpenters and fishermen from military duty. Boston began to export fish in 1633, and fishing villages soon sprang up all along the coast. Gloucester became, as it still continues to be, the most prominent port in the world in the cod and mackerel fisheries off Newfoundland and Labrador. Whales were first caught off Nantucket in 1690, and New Bedford became famous in the whale fisheries, its whaling vessels frequenting the remotest seas. This industry has steadily declined. The United States Fish Commission has extensive hatcheries, laboratory, and school at Woods Hole, and the State has hatcheries at Wilkinsonville and Winchester. In the items of investment and value of products the fishing industry of Massachusetts in 1908 exceeded that of all other States of the Union. It has over one-half of the investment in, more than half of the quantity of, and fully half of the value of, the products of the coast fisheries of New England. The products, derived chiefly from the numerous offshore fishing banks extending along the coast from Nantucket Shoals, Mass., to the Grand Banks of Newfoundland, are, in order of value, codfish, haddock, mackerel, herring, pollack, halibut, lobsters, hake, and numerous species of fish, etc., of less importance. In 1908 there were 11,577 men engaged in fisheries. The capital in 1908 was estimated at $5,749,000. The value of the product for the same year was $7,095,000. The industry is concentrated almost entirely in the cities of Boston and Gloucester, particularly in the former. The returns for 1908 show that fully 50 per cent of the industry was located in Essex County.

Forest Products. The area of standing forest in 1908 was 8040 square miles, representing about 39 per cent of the area of the State. Very little of this, however, was of any commercial value. In 1909 there were forest products to the value of $2,668,410 cut or produced on farms. The lumber sawed in 1913 amounted to 224,580 M feet, board measure.

Manufactures. Massachusetts is preëminently a manufacturing State, its early industrial development being due in part to the fact that it contained one of the first permanent settlements of North America. The superior water-power advantages which the State affords were largely instrumental in bringing about the establishment of a number of important mills and factories. There were, in 1910, 12 cities with a population of over 50,000. There were also 43 cities and towns having a population of over 10,000 but less than 50,000. These 55 cities and towns contained 77.4 per cent of the total population and were credited in 1909 with 82.9 per cent of the total value of its manufactures.

The raw materials used in the manufacturing industries of Massachusetts are for the most part produced elsewhere, and most of its manufactured products are sold for consumption beyond its borders. It has excellent steam-railway facilities (see *Transportation*), and the network of electric railways is not only an important factor in connection with its manufactures, but adds greatly to its facilities for local trade. Massachusetts in 1909 was surpassed only by New York, Pennsylvania, and Illinois in the value of manufactured products. The table on page 206 gives the most important figures relative to manufactures in 1909 and in 1904.

There were, in 1909, 76 industries or industry

groups for which products valued at more than $50,000 were reported. These industries include four with products exceeding $50,000,000 in value, six with products between $25,000,000 and $50,000,000 in value, and 16 with products between $10,000,000 and $25,000,000 in value, making an aggregate of 26 industries with a value of products in excess of $10,000,000 each. There were in addition 15 industries with products between $5,000,000 and $10,000,000 in value, 23 with products between $1,000,000 and $5,000,000 in value, and 12 with products between $500,000 and $1,000,000 in value.

While a few industries predominate, there are a very large number which are of considerable importance. The leading products, measured by value, are boots and shoes, cotton goods, woolen goods, and foundry and machine-shop products. The textile industries considered as a whole much exceed boots and shoes in importance. They comprise chiefly the manufacture of cotton goods, including small cotton wares; woolen, worsted, and felt goods, and woolen hats; cordage and twine and jute and linen goods; hosiery and knit goods; carpets and rugs, other than rag; silk and silk goods, including throwsters; fur-felt hats; and shoddy. Combined, the eight allied industries gave employment in 1909 to an average of 192,147 wage earners, and the value of their products amounted to $387,063,000. Massachusetts is not only the foremost State in the Union in the production of all textiles combined, but is first as regards three of the most important branches—cotton goods, including cotton small wares; woolen, worsted, and felt goods and woolen hats; and cordage and twine and jute and linen goods. It ranks third in the production of carpets and rugs and fifth in silk and silk goods and in fur-felt hats. In addition to the manufacture of textiles there are large industries which are engaged in the dyeing and finishing of textiles, which includes the bleaching, dyeing, and mercerizing of raw fibres, yarns, and woven cloth, as well as the printing of cotton piece goods. These rank twelfth among the industries of the State, as measured by value of products, which was $21,893,000. The manufacture of cotton goods is the most important among textile industries. There were engaged in these manufactures 9,377,984 spindles and 234,249 looms. The cotton consumed during 1909 amounted to 622,368,027 pounds. Although

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — FIFTEEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	Persons engaged in industry: Total	Persons engaged in industry: Wage earners (average number)	Capital	Wages	Value of products	Value added by manufacture
					Expressed in thousands			
All industries	1909	11,684	644,399	584,559	$1,279,687	$301,173	$1,490,529	$659,764
	1904	10,723	532,481	488,399	965,949	232,389	1,124,092	497,682
Boots and shoes, including cut stock and findings.	1909	860	90,048	83,063	90,243	45,990	236,343	83,353
	1904	893	75,156	70,148	59,925	36,175	173,680	63,070
Boots and shoes, rubber	1909	8	7,451	6,928	15,692	3,376	18,722	8,082
	1904	7	7,971	7,674	14,845	3,754	39,035	25,857
Bread and other bakery products	1909	1,201	9,755	6,697	12,752	3,814	26,146	10,419
	1904	1,108	7,735	5,552	7,017	3,072	18,660	7,939
Clothing, men's, including shirts	1909	254	8,208	7,335	8,242	3,398	18,314	8,558
	1904	187	6,175	5,263	6,325	2,311	14,913	6,837
Confectionery	1909	117	6,398	5,548	7,371	1,860	15,266	6,077
	1904	93	4,664	4,167	3,747	1,302	9,318	3,810
Cordage and twine and jute and linen goods.	1909	31	7,003	6,690	17,510	2,560	16,632	5,434
	1904	27	5,061	4,892	12,698	1,667	15,523	3,900
Cotton goods, including cotton small wares.	1909	182	110,686	108,914	214,017	45,117	186,462	81,305
	1904	161	90,239	88,640	174,552	32,555	130,069	49,801
Electrical machinery, apparatus, and supplies.	1909	83	16,725	14,507	32,961	8,209	28,143	15,408
	1904	72	9,706	8,798	12,735	5,003	15,882	8,558
Foundry and machine-shop products	1909	857	49,393	44,179	103,052	27,032	86,926	55,744
	1904	777	39,570	35,844	78,022	20,834	63,750	39,324
Leather, tanned, curried, and finished	1909	132	11,006	10,252	41,197	5,444	40,002	11,236
	1904	132	9,752	9,074	27,070	4,556	33,353	10,312
Lumber and timber products	1909	708	10,478	8,976	17,552	5,031	23,026	10,542
	1904	618	9,836	8,501	13,714	4,501	20,308	9,113
Paper and wood pulp	1909	88	13,742	12,848	42,524	6,542	40,097	17,747
	1904	87	12,365	11,705	41,074	5,588	32,012	14,065
Printing and publishing	1909	1,279	24,410	17,532	33,473	11,684	47,445	34,564
	1904	1,144	20,933	15,112	28,265	9,064	39,274	28,356
Slaughtering and meat packing	1909	94	3,832	3,325	15,547	1,837	44,403	5,517
	1904	80	3,520	3,027	12,983	1,595	38,012	4,131
Woolen, worsted, and felt goods, and wool hats.	1909	183	55,533	53,873	133,955	24,593	141,967	53,991
	1904	190	45,264	44,050	104,257	18,137	99,314	36,536

the manufacture of cotton goods under the factory system in the United States began in Rhode Island in 1790, the introduction in 1814 of the power loom and at about the same time of the dressing machine in Waltham, Mass., marked the beginning of the real growth of the industry. The manufacture of woolen, worsted, and felt goods and wool hats is second in importance among the textile industries. The manufacturing processes involved in the production of woolen and worsted goods in the United States were largely perfected in Massachusetts. As early as 1839 there were 144 mills in operation in the State. In 1909, 156,338,534 pounds of wool were consumed in this industry. Although the major part of the wool consumed is domestic wool, the relative increase in foreign wool has been more rapid, particularly for the period 1904–09. The manufacture of cordage and twine and jute and linen goods ranks third among textile manufactures, and hosiery and knit goods fourth. The first stocking factory in the United States was established at Newburyport in 1831. The principal products of the carpet factories in the State are Wilton, Axminster, and Brussels carpets, and of the silk mills, plain and fancy silk-mixed broad silks.

Measured by value of products, the manufacture of boots and shoes is the most important industry. In 1909, 102,826,648 pairs of boots and shoes were produced in the factories of Massachusetts. This is 41.5 per cent of the total number reported for the United States. Of the 860 establishments connected with this industry 469 were engaged primarily in the manufacture of boots and shoes in 1909, 215 in the production of boot and shoe findings, and 176 in the manufacture of boot and shoe cut stock. Although this industry is one of the oldest in the State, dating from about 1629, it was not until after the period from 1851 to 1865, when various kinds of shoemaking machinery were introduced, that the real expansion of the industry began. Massachusetts leads all other States in the combined industry and in each of the three separate branches.

The development of industries connected with foundry and machine-shop products has been in a measure dependent upon, and largely stimulated by, the growth of the textile, boot and shoe, printing and publishing, paper and wood pulp, and other important industries which employ machinery extensively in their manufacturing processes. A large part of the machinery used in the United States for these industries, particularly in the first two, is manufactured in the State.

Massachusetts is one of the most important of the States in the manufacture of paper and wood pulp. The mills engaged in the production of paper alone largely predominate. This branch of industry was developed and brought to its high standard of efficiency mainly in Massachusetts, and for many years it has ranked among the principal manufacturing activities.

The leather industry includes establishments primarily in the manufacture of leather and those which treat hides or skins for others. Calf and kid skins constitute the most important class of material used in these manufactures. Massachusetts ranks third in the Union in this industry with respect to value of products.

While neither the manufacture of men's clothing nor that of women's clothing is among the 10 leading industries, the two industries combined had in 1909 an output valued at $30,042,000.

In the manufacture of electrical machinery, apparatus, and supplies, Massachusetts is of leading importance. In 1909 the allied industries engaged in the manufacture of jewelry, silverware, and plated ware, and in the reducing and refining of gold and silver from clippings, sweepings, and scrap, combined, employed an average of 9966 wage earners and turned out products valued at $23,109,000. This group had its beginning about 1805, the chief finished products at that time being such articles as silver spoons, gold beads, and finger rings, and later included a cheaper grade of jewelry, in the manufacture of which Massachusetts is now one of the leading States. It leads all other States in the production of rubber footwear. In addition to the industries named there are five others in which, though they are not among the leading ones of the State as measured by value of products, Massachusetts leads all other States of the Union. These industries are the manufacture of paper goods outside of paper mills; the manufacture of cutlery and tools; the manufacture of whips; the manufacture of bicycles, motor cycles, and parts; and the making of shoe lasts.

The total number of wage earners in 1909 was 584,559, of whom 401,172 were males and 183,387 were females. The wage earners under 16 years of age numbered 20,735, of whom about half were males. In the carpet and rug and cotton-goods industries and in the manufacture of cordage and twine over two-fifths of the wage earners are women 16 years of age and over; in the knitting mills, over one-half; in the silk mills, nearly three-fifths; and in the woolen and worsted mills, nearly two-fifths. Of the wage earners employed in the manufacture of boots and shoes, including cut stock and findings, nearly one-third are women 16 years of age and over. For a great majority of the wage earners employed in the manufacturing industries the usual hours of labor are between 54 and 60 a week.

Boston is of course the most important city as measured both by the number of wage earners and the value of products. There were in that city, in 1909, 69,637 wage earners, and the value of products was $237,457,472. Lawrence held second place in importance in 1909. Worcester is the third city in rank according to value of products, and Lynn ranks fourth. Lynn, Brockton, and Haverhill, with the exception of St. Louis, Mo., which held third place in 1909, are the three most important centres of the boot and shoe industries of the United States, ranking in the order named. Fall River, Lowell, and New Bedford, which in the value of manufactured products in 1909 ranked fifth, sixth, and seventh, respectively, in the State, owe their prominence primarily to the manufacture of cotton goods. These three cities lead all others in the United States in the manufacture of this class of textiles. Cambridge is an important manufacturing city, but it is dependent upon no one industry for its industrial position. Holyoke is the centre of the paper industry in the State and also the leading city in the United States in the manufacture of fine paper. The manufacture of all textiles combined, however, is even more important in Holyoke than the paper industry. Other important manufacturing places are Somerville (q.v.), which outranks all others in the slaughtering and meat-packing

industries, Springfield, Fitchburg, Chelsea, Peabody, Woburn, Taunton, Plymouth, Webster, North Adams, Clinton, Northampton, Adams, Newton, Methuen, Pittsfield, and Attleboro. These by no means include all the important manufacturing cities of the State. Nearly all cities, and many towns, are engaged in important manufactures of some sort. Further information in regard to these cities and towns will be found in their alphabetical place in other portions of this work.

Transportation. Massachusetts is well provided with transportation facilities both by land and by water. Most of the railway lines centre in Boston and the mileage for the eastern end of the State is greatly in excess of that of the other parts. The first railroad in the United States was the Quincy Railroad, 3 miles long, constructed in 1826–27 to convey granite from the Quincy quarries for the Bunker Hill Monument. It was not, however, operated by steam. The Boston and Lowell steam railroad was opened in 1835. At about the same time roads were built to Providence and to Worcester, and by 1842 the latter line had been extended to Albany. One of the most important public works ever undertaken by the State was the construction of the Hoosac Tunnel (see TUNNEL) completed in 1873. The total mileage of track of all kinds in 1914 was 4927, of which 2125 was main-line track. There were in 1914 three important railway companies—the Boston and Albany, 961; Boston and Maine, 1967; and New York, New Haven, and Hartford, 1833. By a process of amalgamation which forms an interesting chapter in railroad history the Boston and Maine and most of the important trolley and steamship lines were acquired by the New York, New Haven, and Hartford Railroad. This corporation continued to hold them until 1914, when it was compelled by the United States government to relinquish its control over the Boston and Maine and its other holdings in the trolley and steamship companies in New England. (See RAILWAYS.) The development of electric railways has been an important factor in connection with manufactures, and they have added greatly to the facilities for local trade. The electric railway mileage in 1912 was 2328. The railways are under the supervision of a State Public Service commission, which has the power to regulate rates and charges.

The State has been generous in the construction and repair of highways. In 1912 the highway commission was authorized to issue $5,000,000 in scrip for the construction of State highways from 1913 to 1917. Maritime commerce has from the earliest days of the history of the State been of the greatest importance. Boston, the second seaport in importance on the Atlantic coast, furnishes excellent opportunities for domestic and foreign commerce. The Cape Cod Canal, which shortens the distance between Vineyard Sound and Boston by 70 miles, was formally opened in July, 1914. (See CANAL.) Several other cities and towns have good water facilities, which augment to some extent the water traffic to and from Boston and ports outside the State. Maritime commerce dates from the first days of the colony. As early as 1631 Governor Winthrop launched, for coast trade, a bark called the *Blessing of the Bay*, and a few years later vessels were plying regularly between the various ports. Early in the eighteenth century there was a large West Indian trade. Many ships were also built for the French and Spaniards, who paid for them largely in rum and molasses. After the Revolution an immense trade with the East Indies and with the African coast was developed. Still later, notably between the years 1840 and 1860, the clippers built at East Boston and Newburyport were the fastest ships then known, and carried on no small share of the world's freighting. The outbreak of the Civil War, however, nearly paralyzed the commerce of American shipowners, and it has never fully revived. There are several lines of steamers running from New York to Boston. There are also several steamship lines connecting with Europe and the West Indies. The customs districts are Barnstable, Boston, and Charlestown, Fall River, Gloucester, Marblehead, New Bedford, Newburyport, Plymouth, Salem, and Beverly. The total imports received in Boston and Charlestown in 1913 amounted to $146,599,451, and the exports from these ports were valued at $69,552,657.

Banks. The first commercial bank in the Colonies is said to have been established in Boston in 1686. The Massachusetts Land Bank was started in 1739, but all Colonial banks were prohibited in 1740. The Massachusetts Bank, organized in Boston in February, 1784, was the first local bank in the State and the second in the Union. The Union Bank of Boston was chartered in 1792. By the beginning of the nineteenth century five banks had been incorporated in the State. Massachusetts was the first State to require (1803) semiannual bank reports to be sworn to by the directors. Thus its banks were put on a firmer basis and passed through the panic of 1808–09 in better shape than the other New England banks as a rule. In 1814 again the Massachusetts banks showed their superior strength. A comprehensive banking law was enacted in 1829, with stringent provisions as to capitalization and limits of circulation. Yet these were evaded during the speculative régime of 1830–36; as a consequence in the financial depression 1837–44, 32 banks failed. In 1838, however, a system of official examination of banks by a board of bank commissioners was adopted. The banking law of 1857 provided for one commissioner. Under this improved system there was only one bank failure in the panic of 1857. When the system of national banks was introduced State banks of discount were prohibited and do not exist at present. The necessity for loans on real estate (which the national banks are prohibited from making) led to the development of trust companies. Savings banks are numerous and popular, and their investment and general management are strictly regulated by law. On Sept. 12, 1914, there were 172 national banks, with capital $55,842,500, surplus $36,403,925, cash, etc., $11,163,699, loans $347,016,143, and deposits $327,909,915; 69 loan and trust companies, with an aggregate capital of $25,438,800, surplus of $22,666,025, cash $23,428,307, loans of $242,351,487, and deposits $296,104,997; 196 savings banks, with 2,305,340 depositors and deposits of $895,178,637.

Government. The constitution of Massachusetts was agreed upon by delegates of the people in convention which was held at Cambridge between Sept. 1, 1779, and March 2, 1780, when the convention adjourned to meet on the first Wednesday of the ensuing June. In the meantime the constitution was submitted to the people, who approved of it by a two-thirds vote.

The constitution has been amended many times. Amendments may be proposed in the General Court, and if agreed to by a majority of the Senators and two-thirds of the members of the House of Representatives present and voting thereon, are referred to the next General Court. If this court agrees to the proposition in the same manner it shall be submitted to the people, and if approved by them by a majority vote, becomes a part of the constitution.

Legislative.—The legislative department consists of a Senate and a House of Representatives and is known as the General Court of Massachusetts. The General Court meets every year on the first Wednesday in January. The House of Representatives consists of 240 members apportioned to the several counties of the Commonwealth. The Senate is the first branch of the Legislature. It has power to try all impeachments brought by the House. The two-thirds veto of each House overrides the Governor's veto.

Executive.—The supreme executive magistrate is the Governor. He is chosen annually, and at the time of his election must have been an inhabitant of the Commonwealth for seven years next preceding. There is a Council composed of eight members, elected annually for the purpose of advising the Governor, which exercises the power of chief executive when both the offices of Governor and Lieutenant Governor are vacant. Other executive officials are the Secretary, Treasurer, Receiver General, Auditor, and Attorney-General. They are elected annually and hold office for the same length of time as the Governor.

Judiciary.—Judicial officers are appointed by the Governor with the consent of the Council and they hold office during good behavior. They may be removed from office by the Governor upon the address of both Houses of the Legislature. The supreme judicial court consists of a Chief Justice and six associate justices. The superior court consists of a Chief Justice and 15 associate justices. Each county has a probate court and a court of insolvency, which are distinct in their jurisdiction, powers, etc., but have the same judge and register. These courts are held by the judge of probate and insolvency appointed for the county, but the judges of the several counties may, in case of necessity or convenience, interchange services.

Suffrage and Elections.—Every male citizen of 21 years of age and upward, excepting paupers and persons under guardianship, who shall have resided within the Commonwealth one year and within the town or district in which he may claim a right to vote six calendar months next preceding any election of Governor, Lieutenant Governor, Senators, or Representatives, has a right to vote. No person shall have the right to vote or be eligible to office under the constitution who shall not be able to read the constitution in the English language and write his name. These provisions do not apply to any person prevented by physical disability from complying with its requisitions. The election for the choice of Governor, Lieutenant Governor, Senators, and Representatives is held on the Tuesday next after the first Monday in November, annually. The Legislature of 1907 passed an Act codifying the laws relative to caucuses and elections. In every city except Boston there is a board of registrars of voters, consisting of four persons appointed by the mayor with the approval of the board of aldermen, and in every town having less than 300 voters registered, the selectmen and the town clerk constitute a board of registrars of voters. Each political party annually elects a State committee, the members of which hold office for one year from the first day of January next following their election. Cities and towns may adopt the provisions of the law for nominating by primaries. Nominations of candidates for any offices may be made by nomination papers and signed in the aggregate by not less than 1000 voters for each candidate. There is a State ballot-law commission, consisting of three persons appointed by the Governor for a term of three years. The names of all candidates except for presidential electors must be arranged under the designation of the office in alphabetical order. There are severe penalties for corrupt practices in elections. Nominations for Senator or Representative are made by a direct plurality vote in accordance with an Act approved by the people in 1910, and by the terms of a provision passed in 1911 the nomination of candidates of political parties for all offices to be filled by State election except the office of presidential elector and the election of district members of State committees, members of ward and town committees, and of delegates to State conventions of political parties, shall be by direct plurality vote in primaries. Business corporations are prohibited from making political contributions. The Legislature of 1912 passed a measure providing for the direct election of delegates to national conventions and making provision for the expression of preference for candidates for President and Vice President of the United States. The Legislature of 1913 amended the election laws so as to permit questions of instruction on public policies to be submitted to the voters on the official ballot. Women have the right to vote for school committees.

Local and Municipal Government.—Municipal governments may be established by the General Court in towns exceeding 12,000 population, with the consent and upon the application of a majority of the inhabitants. Unincorporated towns are governed by selectmen elected annually at town meetings. Cities and towns may adopt the commission form of government.

Miscellaneous Constitutional, and Statutory Provisions.—Wilful desertion for three years, failure to provide for that period, and habitual drunkenness are among the causes for which divorces are granted. It is unlawful for any person, partnership, or association to require an employee engaged in any commercial occupation to do on Sunday the usual work of his occupation unless such employee is allowed during the six days next ensuing 24 consecutive hours without labor. Gambling and betting in public places are forbidden. There are strict child-labor laws and measures providing for workmen's compensation and labor arbitration. The manufacture and sale of cocaine are prohibited. There are stringent laws against white-slave traffic. Women, and children under 18 years of age, are prohibited from being employed more than 54 hours a week in manufacturing or mechanical establishments. Every town and city of more than 10,000 inhabitants is required to maintain a dispensary for the discovery, treatment, and supervision of needy residents afflicted with tuberculosis. Counties are permitted to establish pension systems for their employees.

There is a retirement system for State employees, which is practically an assisted old age pension. There are stringent pure-food laws, and the Legislature of 1913 passed a measure providing for mothers' pensions. By the same Legislature a uniform marriage law was passed. The sale of liquor in the State is regulated by municipal and town local option laws which went into effect in 1881.

Finance. In matters of finance and taxation Massachusetts has always been one of the most progressive of the States. The Colony in 1646 introduced a system of direct taxation and a poll tax, and soon after a "faculties" tax, which had income as a basis. The first Treasurer's report was published in 1655. When Massachusetts was reorganized in 1690 under a provincial charter direct taxation upon property and a poll tax were again made the main foundation of the revenue system. In the middle of the eighteenth century lotteries were established for many extraordinary and even normal needs of the Treasury. The system was abandoned in 1765, only to be reëstablished at the advent of the Revolution. The direct debt in 1786 was $5,000,000 and the State's share of the national debt was as much more. The immediate current liabilities in that year were $1,500,000. A large part of this debt was, however, assumed by the Federal government in 1790. Up to 1794 the State debt was almost canceled. In the early part of the nineteenth century a well-regulated system of taxation of corporations grew up. In 1812 banks were taxed, and insurance companies after 1832. During the Civil War the public debt greatly increased. At one time it amounted to more than $32,000,000. By 1871, however, it had been reduced to $16,573,000, for the payment of which there was created a sinking fund of $8,261,000. On account of many railroad loans and other public improvements the debt again grew rapidly in the seventies, but it was always well provided by the sinking fund. On Dec. 1, 1914, the debt amounted to $112,964,-662. The sinking-fund assets amounted to $38,-263,060, leaving the net debt $84,701,602. This may be divided into two parts—the direct debt, which is an obligation incurred for the benefit of the entire State, and the contingent debt, which, while a direct debt, has been incurred for the benefit of 41 cities and towns in the vicinity of and including Boston, called the metropolitan district. This was incurred to aid in the administration of certain improvements, such as the construction of water, sewer, and park systems, etc. The various cities and towns benefited refund this amount by means of sinking-fund assessments levied by State boards of commissioners and paid at the same time and in the same manner as State taxes. The per capita debt, which in 1880 was $11.66, had increased to $23.49 in 1914. Massachusetts has a larger debt than any other State except New York. The report of the Receiver General showed a cash balance on hand on Dec. 1, 1913, of $8,220,590. The total receipts for the fiscal year 1914 amounted to $43,241,099 and the total expenditures were $43,386,669, leaving a balance on hand on Dec. 1, 1914, of $8,075,020.

Militia. In 1910 there were 760,324 men of militia age. The organized militia numbered 452 officers and 5341 enlisted men.

Population. The population by decades has been as follows: 1790, 378,000; 1800, 422,000; 1810, 472,000; 1820, 523,000; 1830, 610,000; 1840, 737,000; 1850, 994,000; 1860, 1,231,000; 1870, 1,457,000; 1880, 1,783,000; 1890, 2,238,000; 1900, 2,805,000; 1910, 3,366,416. Population on July 1, 1914, was 3,605,522; 1920, 3,852,356. In 1910 Massachusetts ranked sixth in population among the States. In density of population it ranked second, with 418.8 persons to the square mile. The native-born white population with native parents was 1,103,429, being 32.8 per cent of the total. The native whites of foreign or mixed parentage numbered 1,170,447. There were 1,051,050 foreign-born whites, representing 31.2 per cent of the total population, and 38,055 negroes. The rural population was 241,049. Until the middle of the nineteenth century the people of Massachusetts were almost wholly of English descent. Two movements, however, wrought a vast change with respect to race. The first of these was a migration westward of the native population. The other was the great influx of foreigners, chiefly from Ireland and Canada, those from the latter country being mainly of French descent.

The growth of the manufacturing industries has resulted in a large urban population. Unlike most States, females formed the majority of the population. This is due chiefly to the westward emigration and an increased opportunity for females to find employment in the mills and at domestic service. The total number of males in 1910 was 1,655,248, and of females 1,711,168. There were, in 1910, 71 cities or towns having a population of 8000 or over. This is larger than the number contained in any other State. In 1910 the population of Boston (q.v.), the largest city, was 670,585. The estimated population of the city in 1914 was 733,802. Other large cities with their estimated populations in 1914 are as follows: Worcester, 157,732; Fall River, 125,443; Lowell, 111,004; Cambridge, 110,357; New Bedford, 111,230; Lynn, 97,207; Springfield, 100,375; Lawrence, 95,834; Somerville, 83,881; Holyoke, 62,852; Brockton, 64,043; Malden, 48,979; Haverhill, 47,071; Salem, 46,-994; Newton, 42,455; Fitchburg, 40,507; Taunton, 35,631; Chelsea, 32,452. All of the above are estimates of the United States Census Bureau.

Education. The establishment of public schools was one of the first concerns of the settlers of Massachusetts. The first free school was organized in 1635, and Harvard College was founded in the following year. A statute enacted in 1647 provided that each town having 50 families should maintain a school to teach the children to read and write, and that each town having 100 families should provide a grammar school to fit youths for college. This statute was the foundation for all succeeding educational legislation, and it has resulted in a system which is one of the best in the world. The State Board of Education was created in 1837. Its first secretary was Horace Mann, and his reports and labors gave impulse and vigor to the schools of the entire Union. The local unit of organization is the town (township), each having a school committee appointed by the people and a skilled superintendent appointed by the committee. The central coördinating and supervisory body is the State Board of Education, and between it and the local organizations stand the agents of the State Board, each of whom has his particular district or his special phase of educational work to oversee. This system brings about efficiency and uni-

formity. Ample financial support is provided by taxation and by the income from the State school fund, which was established in 1834 from proceeds derived from the sale of lands in the State of Maine, and from the claims of Massachusetts upon the United States for military services. This fund on Jan. 1, 1913, amounted to $5,000,000. The excellent results obtained from the administration of the school system are shown by the fact that of a total population of 2,742,684 of 10 years of age and over in 1910, the illiterates numbered only 141,541, or 5.2 per cent, and if the foreign-born white population were eliminated the percentage of illiteracy would be only 0.4 per cent, or 3428. Among the negroes of the State the percentage of illiteracy in 1910 was 8.1. According to the thirteenth census the total number of persons of school age (5 to 20 years) in 1910 was 941,376, and of these 614,105 attended school. According to figures furnished by the State Board of Education the number of different pupils of all ages in public schools during the school year ending July 1, 1913, was 557,211. The total number of teachers on that date was 16,979, of whom 15,292 were females and 1687 were males.

In 1909 the Board of Education was reorganized and a commissioner and two deputies were appointed. Towns which have a valuation not exceeding $2,500,000 share in the income of the State school fund. Such towns are also required to belong to superintendency unions, the superintendents of which are paid in part from contributions by the State. A number of these towns also receive aid from the State, either in the shape of the $500 grant for maintaining a high school or reimbursement for the payment of tuition pupils attending a high school in another town or city. Particular attention has been given to the subject of vocational education. A number of cities in the State maintain day and evening industrial schools.

The number of public day schools on June 30, 1912, was 12,396, and in these were 16,433 teachers. The high schools numbered 270, with 2728 teachers and 69,319 pupils. The total expenditure for high-school support was $3,990,923. There were 342 evening schools, with 2134 teachers and 63,272 pupils. The total expenditure for public schools in 1912 was $18,769,204. The cost of the public schools per child in that year was $30.87. There were 47 incorporated academies, with 7000 pupils. Attendance in academies has decreased owing largely to the increasing excellence of the high schools. The Legislature of 1913 passed a measure of great importance providing for the establishment and maintenance of continuation schools and courses of instruction for working children.

There are State normal schools at Bridgewater, Westfield, Hyannis, Fitchburg, Lowell, and Salem. There is also a State Normal Art School at Boston. While the State system of education does not include higher institutions of learning, excepting normal colleges, these have been amply provided by private enterprise. The oldest collegiate institution is Harvard University at Cambridge. The others are Amherst College at Amherst, Boston University at Boston, Tufts College at Tufts College Station, Medford, Williams College at Williamstown, Clark College and University at Worcester, the College of the Holy Cross at Worcester, and Boston College, Boston. Colleges for women are Radcliffe College, affiliated with Harvard University, Cambridge; Smith College at Northampton; Mount Holyoke College at South Hadley; Wellesley College at Wellesley; and Simmons College in Boston. Scientific and technical colleges are the Massachusetts Agricultural College at Amherst (co-educational); the Massachusetts Institute of Technology at Boston; and the Worcester Polytechnic Institute at Worcester. Details in regard to these institutions will be found under their titles. The theological institutions include Andover Theological Seminary, now affiliated with Harvard University, at Cambridge; Newton Theological Seminary (Baptist) at Newton; Harvard Divinity School (nonsectarian) at Cambridge; New Church Theological School at Cambridge; Boston University School of Theology (nonsectarian), under Methodist auspices; Protestant Episcopal Theological School at Cambridge; and Tufts College Divinity School (Universalist) at Tufts College Station, Medford. Medical schools include the Harvard Medical School, the College of Physicians and Surgeons in Boston, Tufts College Medical School, and the Boston University School (homœopathic). There is an Industrial School for Deaf Mutes at Beverly, and schools for the deaf in Randolph and Northampton.

Charities and Corrections. The charitable institutions are under the direction of the State Board of Charities, and the penal and reformatory institutions are administered by a Board of Prison Commissioners. The institutions under the supervision of the Board of Charities are the State Infirmary at Tewksbury, the State Farm at Bridgewater, the Norfolk State Hospital, the Lyman School for Boys at Westborough, the Industrial School for Boys at Shirley, the State Industrial School for Girls at Lancaster, the Massachusetts Hospital School at Canton, the North Reading State Sanatorium, the Rutland State Sanatorium, the Lakeville State Sanatorium, the Wakefield Sanatorium, and the Penikese Hospital (for lepers) on Penikese Island. The supervisory powers of the board over these institutions extend to the right of investigation and recommendation as to any matters relating to the institutions, but the administration of each is vested in a separate board of trustees. The total number of persons under care in these institutions in 1913 was about 20,000, and the cost of administration is about $1,500,000 yearly. In addition to these institutions there are many private hospitals and institutions for the education of special classes. These include Perkins Institution and Massachusetts School for the Blind at Watertown, the Massachusetts School for the Feeble-Minded at Waltham, the State Hospital at Tewksbury, the Hospital for Inebriates at Foxborough, and Hospital for Epileptics at Monson. In addition to these there are many city and town almshouses and over 500 voluntary charitable homes and asylums. The prisons include the State Prison in Boston, the Massachusetts Reformatory at Concord, the Reformatory for Women at Sherborn, the prison camp and hospital at Rutland, and the State Farm at Bridgewater. The prison population at the end of 1913 was about 6000. Convicts in the prisons and houses of correction work only under the public-account system. Both in the State and county institutions the labor of prisoners is under the supervision of the General Superintendent of

Prisons. Prison-made goods must be sold to public institutions instead of in the open market.

The State Board of Charities is vested with greater power than is commonly exercised by similar boards in other States, and its administration has resulted in many improvements, such as the curtailment of unnecessary aid, which creates rather than lessens pauperism, and the more judicious treatment of children who may require the attention of State authorities. The tendency in the latter kind of cases is to find homes for or board children in private families rather than in institutions, great care being taken to find proper homes and to keep in close touch with children placed therein.

Religion. In the Colonial period the population belonged mainly to the Congregational church. Before the end of the eighteenth century the Baptists and Methodists had become prominent and are now leading denominations. In the early part of the nineteenth century Massachusetts became the centre of Unitarianism in the United States. With the coming of large numbers of Irish about the middle of the nineteenth century the Roman Catholic church for the first time became prominent, and it is now much stronger than any one of the Protestant denominations. The Episcopalian, Universalist, and Christian Scientist are also leading sects.

History. In 1602 Bartholomew Gosnold (q.v.) effected a settlement on Cuttyhunk Island, between Buzzards Bay and Vineyard Sound, but the colony was abandoned after three weeks. The first successful attempt at colonization was made by a band of Pilgrims, 102 in number, who came from Leyden in Holland. They were a Puritan sect, known as Separatists or Brownists, who had fled from England to Holland in 1608, to escape persecution and, weary of living in a foreign land, had determined to found a place of refuge in America. Through a company of merchant adventurers a patent was obtained from the Council for New England for a settlement within the limits of "Virginia." They set sail from Delftshaven, July 22, 1620, and from Plymouth in England on September 6. It was their intention to settle south of the Hudson River, but storms drove the *Mayflower* to the neighborhood of Cape Cod, and on December 11 (December 21 N. S., the anniversary of Forefathers' Day being celebrated on December 22) the emigrants landed at Plymouth.

Before landing they drew up and subscribed to a compact or frame of government for the new settlement, and elected John Carver Governor for one year. Shortly after landing they entered into a treaty of peace with the Indian chief Massasoit and his tribe, which remained unbroken for a long time. Within four months 44 of the colonists died from exposure to the cold and the lack of wholesome food, and for two years they suffered many privations, but in 1623 they were relieved by a bountiful harvest. Others from the Leyden church joined them and, by 1631, 600 persons—nearly the whole of that body—had emigrated. In 1624 the property of the Colony, which had been held as common, was divided among the settlers; in 1627 the rights of the trading company were bought out, and two years later a patent confirming the colonists' right to the territory they had occupied was issued to Governor Bradford and others. The Colony grew up in practical independence and, organized as a perfect democracy, it carried on its government without any royal sanction. By 1640 there were eight towns with 2500 inhabitants in the Plymouth Colony. Outside the limits of the Colony several scattered settlements were made in Boston harbor between 1623 and 1628.

In 1628 an expedition organized by an English company and commanded by John Endicott landed at Salem. The company had obtained a grant of the territory lying between the Atlantic and Pacific and extending to a point 3 miles south of the river Charles and 3 miles north of the river Merrimac. After persistent efforts a royal patent was obtained for "the Governor and company" of the Massachusetts Bay, and the associates were constituted a body politic, with a Governor, deputy, and 18 assistants to be annually elected, and a general assembly of the freemen, with legislative powers to meet four times in a year, or oftener if necessary. Measures contrary to English laws and statutes were forbidden by the charter, but religious liberty was not named in the document, though this was the ultimate aim of the emigrants. In 1629 the colony was reënforced and the government and patent of the company were transferred from London to New England. The old officers resigned, giving place to others chosen from among those who were about to emigrate, John Winthrop being elected Governor. The Colony grew rapidly. The conflict between the Puritans and Charles I brought about a large emigration to Massachusetts, and between 1630 and 1640 about 20,000 persons arrived in the Colony. Charlestown, Boston, Watertown, Dorchester, Roxbury, Mystic, Saugus (Lynn), and other places were settled at this period. The settlers of Massachusetts Bay, as distinguished from the Plymouth pilgrims, were wealthy, and as a rule of a higher social class. They came in congregations under the lead of their ministers, who were graduates of the English universities. Fraternal relations were quickly established between the two colonies, however. Education was fostered from the beginning. Harvard College was founded in 1636, and in 1642 a system of public schools was organized. Having no charter to occasion disputes, Plymouth Colony prospered peacefully and monotonously, and its history is unmarred by records of religious narrowness; but Massachusetts Bay was in turmoil from the first, owing to its theocratic government and the stern and arbitrary conduct of the magistrates. It was the desire to escape from the yoke of the Massachusetts theocracy that led to the settlement of Rhode Island and Connecticut. Prejudiced by the dissensions between magistrates and people and by the fear that the Colony would become independent, the crown demanded back the charter in 1634; but the colonists evaded the order, made preparations to resist, and were fortunate in having attention diverted from them by the political troubles in England. To strengthen itself, the Bay government exacted an oath of allegiance in 1633–34, and that he had opposed this oath as well as the patent was the main reason for the banishment of Roger Williams (q.v.). The banishment of Anne Hutchinson (q.v.) and the hanging of Quakers were excused by the authorities on the ground that their teachings endangered the stability of the government; and the same spirit was at the basis of the act which made Church membership a qualification for the franchise, and

finally made the Congregational the established church of the Colony (1651). In 1643 Massachusetts Bay united with Plymouth, Connecticut, and New Haven to form the New England Confederacy, for protection against the Indians and the Dutch.

The restoration of the Stuarts was followed by fresh disputes with the crown, but in 1662 the King confirmed the Massachusetts charter and made a conditional promise of amnesty for past political offenses. He insisted, however, upon his right to interfere in the affairs of the Colony, required the complete toleration of the Church of England, the taking of an oath of allegiance, and the administration of justice in his name. Commissioners were sent over from England to investigate the affairs of the Colony, but they met with defiance from the magistrates and could accomplish nothing. The contest with the crown continued in spite of the pressure of the Indian War (1675–76), in which the New England Colonies were plunged. (See PHILIP, KING.) Charles II was incensed at the independent course of the Colony in assuming certain sovereign powers, as it had done in coining money or taking possession of the Maine settlements. The English merchants were irritated by the active trade that was carried on illegally with the West Indies and Europe. Edward Randolph (q.v.) urged on the English government against the Colony, and Massachusetts, under its theocracy, on its side, would make no concession. In 1684 the charter of the Colony was declared forfeited, the General Court was dissolved, and a royal commission superseded the charter government. In 1686 Sir Edmund Andros was made Governor and ruled without restraint and without sense. When news of the landing of William of Orange in England arrived, the people of Boston threw Andros into prison, reinstated the old magistrates, and revived the General Court. In 1692 a new charter was granted uniting Massachusetts Bay and Plymouth. Its terms, however, were less favorable than the old charter, in that the Governor, Deputy Governor, and Secretary were to be appointed by the King, and the members of the Assembly were to be elected by freeholders instead of Church members. In 1692–93 the witchcraft delusion broke out in Salem and vicinity, but the excitement was short-lived and was confined to a limited area. (See WITCHCRAFT.) In 1703–04 and 1722–25 there were wars with the Indians. The Colony aided England zealously in her contest with France, notably in the capture of Port Royal (1690) and of Louisburg (1745). (See PEPPERELL, WILLIAM.) In the early French and Indian wars the settlers of western Massachusetts suffered greatly at the hands of the Indians; towns like Haverhill and Deerfield were subjected to pillage, many of the inhabitants were massacred and the survivors led away into captivity. In 1765 the population of Massachusetts was about 240,000, falling into well-defined classes, but all equal in political power and held firmly together by the consciousness of a common origin and the possession of a common creed. The austerity of seventeenth-century Puritanism had passed away in great measure, but Church and state were still connected, and the Great Revival of 1740 showed how deeply faith lay rooted in the hearts of the people. The first printing press had been brought over in 1639, and a newspaper, the Boston *News Letter*, was issued in 1704. Educational institutions were being constantly founded. Property was well diffused, though for half a century after 1690 the Colony suffered from a reckless financial policy, which flooded the country with paper money. In resistance to the arbitrary acts of the British Parliament Massachusetts was the pioneer. The struggle against the writs of assistance and the famous speech of James Otis (May, 1761) marked the opening of the contest which ended in independence. The opposition to the Stamp Act, the Boston massacre, the destruction of the tea in Boston harbor, the closing of the port of Boston, and the virtual annulment of the charter followed in rapid succession. In October, 1774, the General Court resolved itself into a Provincial Congress and proceeded to erect an independent State government. The organization of a militia and the storing of supplies led to Lexington and Concord. (For military operations during the Revolution, see UNITED STATES.) In the war Massachusetts took the leading part, though her population was by no means united in the cause of the Revolution. Among the Loyalists who were banished or who voluntarily abandoned their homes were many of the most prominent and wealthy families. In 1780 a constitution was adopted, and by the Bill of Rights, prefixed to it, slavery, as was subsequently decided by the courts, was abolished. In 1786 the rising known as Shays's rebellion, occasioned by heavy taxes and the poverty of the people, occurred in the western part of the State. The Anti-Federalist element in the State was powerful till 1797, and the United States Constitution was ratified in January, 1788, by the close vote of 187 to 168. After 1797 the Federalist party became predominant, the opposition to the War of 1812 was bitter, and delegates from Massachusetts participated in the Hartford Convention (q.v.). The State remained stubbornly Federalist long after the party had disappeared everywhere else, and as a result it took little interest in national affairs. With the passing of the Federalist party greater liberty of thought came into the fields of politics and religion. In 1815 "dissenters" were released from paying taxes to support Congregational ministers, and in 1833 the Congregational church was disestablished. Educational development continued under all régimes. In 1739 Williams College and in 1821 Amherst College were founded, and in 1837 a State Board of Education was created. The antislavery movement had its birth in Massachusetts, and at Boston William Lloyd Garrison (q.v.) began the publication of the *Liberator* on Jan. 1, 1831. Abolitionism grew rapidly after 1840 and was favored in its growth by such episodes as the capture of the runaway slave Shadrach in the streets of Boston in 1851 and of Anthony Burns in 1854. In the Civil War, under the administration of the patriotic Governor, John A. Andrew, the state contributed nearly 160,000 men to the Union armies.

Legislation since the Civil War has dealt largely with the questions of the liquor trade, the regulation of corporations, municipal government, the civil service, and labor. As early as 1853 a law reducing the working day from 12 hours to 10 was passed. Since then the State has been active in caring for the industrial classes, to such an extent, indeed, that after 1895 the depressed condition of the textile trades was attributed by some to the fact that employers were unduly hampered by oppressive

State regulations passed to protect labor and could not meet the competition of the rising manufactures of the South. In 1898 and subsequent years a succession of strikes among the mill operatives caused great distress among the working classes.

The period after the Civil War witnessed the rise of many political movements. The temperance question came into prominence in 1867; the question of the admission of women to the suffrage was agitated up to 1880; the national Labor party exerted great influence in 1878. From 1858 to 1874 the State government was Republican. In 1874 the Democrats elected their candidate for Governor on an antiprohibition platform; in 1882 they were victorious with Benjamin F. Butler as their candidate. In 1890 the revelation of corruption in the Legislature brought about the choice of a Democratic Governor in the person of William E. Russell, whose great popularity caused him to be reëlected in 1891 and 1892. Until 1909 the State was Republican by heavy majorities. Curtis Guild, Jr., was elected Governor in 1906 and reëlected in 1907. At the presidential election of 1908 Taft carried the State with 265,966 votes to 155,453 for Bryan. Eben S. Draper, Republican, was elected Governor, and was reëlected in 1909, but by a greatly reduced plurality, and in the following year he was defeated by Eugene N. Foss, a former Republican, who ran as an independent candidate on a so-called Progressive-Democratic ticket. Mr. Foss made his campaign on the issue of the tariff. The Republicans elected the other State officers. H. C. Lodge, whose term in the Senate expired in 1911, was reëlected by the Legislature in January of that year. In the State election in 1911 Governor Foss was reëlected and was again the only Democratic official who was successful.

Massachusetts was one of the hardest-fought battle fields in the presidential election of 1912. The Progressive party was aggressive and both Mr. Roosevelt and Mr. Taft made notable addresses. As a result of the division in the Republican party Wilson carried the State with 173,208 votes compared with 155,948 for Taft and 142,228 for Roosevelt. Foss was again reëlected governor. The Democrats also elected the Lieutenant Governor and Secretary of State. Mr. Foss was a candidate for reëlection again in 1913, but was defeated in the primaries. In the election on November 5 of that year David I. Walsh, Democrat, was elected with 180,460 votes compared with 126,700 for Bird, Progressive, and 116,300 for Gardner, Republican. Mr. Foss, who ran independently, received about 20,000 votes. As a result of this election the Republicans lost their majority in the Lower House, in which the Progressives held the balance of power. In January, 1913, John W. Weeks was elected United States Senator by the Legislature to succeed W. Murray Crane. The Democrats remained in power in 1914, electing their candidate for Governor with 210,442 votes. That the Republicans had made up a great part of their losses of the several years previous was shown by the fact that the Republican candidate, S. W. McCall, received only about 12,000 votes less than the successful candidate. The Progressive vote fell from 142,228 in 1912 to 32,145 in 1914. In national elections Massachusetts has been Federalist, Whig, and Republican, with the exception of the years 1804 (Jefferson), 1820 (Monroe), 1824 and 1828 (John Quincy Adams), and 1912 (Wilson).

Colonial and State Governors of Massachusetts:

PLYMOUTH COLONY

John Carver	1620–21
William Bradford	1621–33
Edward Winslow	1633–34
Thomas Prence	1634–35
William Bradford	1635–36
Edward Winslow	1636–37
William Bradford	1637–38
Thomas Prence	1638–39
William Bradford	1639–44
Edward Winslow	1644–45
William Bradford	1645–57
Thomas Prence	1657–73
Josiah Winslow	1673–81
Thomas Hinckley	1681–86
Sir Edmund Andros (Governor-General)	1686–89
Thomas Hinckley	1689–92

Plymouth Colony absorbed by Massachusetts Bay.

MASSACHUSETTS BAY COLONY

John Endicott	1629–30
John Winthrop	1630–34
Thomas Dudley	1634–35
John Haynes	1635–36
Henry Vane	1636–37
John Winthrop	1637–40
Thomas Dudley	1640–41
Richard Bellingham	1641–42
John Winthrop	1642–44
John Endicott	1644–45
Thomas Dudley	1645–46
John Winthrop	1646–49
John Endicott	1649–50
Thomas Dudley	1650–51
John Endicott	1651–54
Richard Bellingham	1654–55
John Endicott	1655–65
Richard Bellingham	1665–73
John Leverett	1673–79
Simon Bradstreet	1679–84
Joseph Dudley (President of Council)	1684–86
Sir Edmund Andros (Governor-General)	1686–89
Simon Bradstreet	1689–92
William Phips	1692–94
William Stoughton	1694–99
Richard Coote, Earl of Bellemont	1699–1700
William Stoughton (acting)	1700–01
The Council	1701–02
Joseph Dudley	1702–15
The Council	1715
Joseph Dudley	1715
William Tailer (acting)	1715–16
Samuel Shute	1716–23
William Dummer (acting	1723–28
William Burnett	1728–29
William Dummer (acting)	1729–30
William Tailer (acting	1730
Jonathan Belcher	1730–41
William Shirley	1741–49
Spencer Phipps (acting)	1749–53
William Shirley	1753–56
Spencer Phipps (acting)	1756–57
The Council	1757
Thomas Pownall	1757–60
Thomas Hutchinson (acting)	1760
Sir Francis Bernard	1760–69
Thomas Hutchinson	1769–74
Thomas Gage	1774
The Council	1774–80

STATE

John Hancock		1780–85
James Bowdoin		1785–87
John Hancock		1787–93
Samuel Adams		1793–97
Increase Sumner	Federalist	1797–99
Moses Gill (acting)	"	1799–1800
Caleb Strong	"	1800–07
James Sullivan	Democratic-Republican	1807–08
Levi Lincoln (acting)	"	1808–09
Christopher Gore	Federalist	1809–10
Elbridge Gerry	Democratic-Republican	1810–12
Caleb Strong	Federalist	1812–16
John Brooks	"	1816–23
William Eustis	Democratic-Republican	1823–25
Marcus Morton (acting)	"	1825
Levi Lincoln	Democrat and Federalist	1825–34
John Davis	Whig	1834–35
Samuel T. Armstrong (acting)	"	1835–36
Edward Everett	"	1836–40
Marcus Morton	Democrat	1840–41
John Davis	Whig	1841–43
Marcus Morton	Democrat	1843–44
George N. Briggs	Whig	1844–51
George S. Boutwell	Democrat and Free Soil	1851–53
John H. Clifford	Whig	1853–54
Emory Washburn	"	1854–55
Henry J. Gardiner	American	1855–58

Nathaniel P. Banks	Republican	1858–61
John A. Andrew	"	1861–66
Alexander H. Bullock	"	1866–69
William H. Claflin	"	1869–72
William B. Washburn	"	1872–74
Thomas Talbot (acting)	"	1874
William Gaston	Democratic	1875–76
Alexander H. Rice	Republican	1876–79
Thomas Talbot	"	1879–80
John D. Long	"	1880–83
Benjamin F. Butler	Democrat and Independent	1883–84
George D. Robinson	Republican	1884–87
Oliver Ames	"	1887–90
J. Q. A. Brackett	"	1890–91
William E. Russell	Democrat	1891–94
Frederick T. Greenhalge	Republican	1894–96
Roger Wolcott		1896–1900
Winthrop Murray Crane	"	1900–03
John L. Bates	"	1903–05
William L. Douglas	Democrat	1905–06
Curtis Guild, Jr.	Republican	1906–08
Eben S. Draper	"	1908–10
Eugene N. Foss	Progressive-Democrat	1910–13
David I. Walsh	Democrat	1913–16
Samuel W. McCall	Republican	1916–19
Calvin Coolidge	"	1919–21
Channing Cox	"	1921–

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MASSACHUSETTS AGRICULTURAL COLLEGE. An institution for agricultural training, founded at Amherst, Mass., in 1867. The total amount of property owned by the college is 660 acres, of which 175 acres comprise the college campus, 75 acres belong to the experiment station, 100 acres to the horticultural department, and 250 acres to the college farm. The courses given include an extension service connected with a winter course, a summer school, farmers' week, extension schools, and correspondence courses. There is also a graduate school which offers the degree of M.Sc., Ph.D., and M.Agr. The buildings and land belonging to the college were valued in 1915 at $815,000 and the equipment at $430,000. It is supported chiefly by appropriations from the State Legislature. There were enrolled in all departments in 1914–15 about 600 students; of these 182 were enrolled in the winter school and 168 in the summer school. The instructors numbered 60. The library contains about 44,000 volumes. The president in 1915 was Kenyon L. Butterfield.

MASSACHUSETTS BAY. A wide, triangular indentation of the eastern coast of Massachusetts, extending from Cape Ann to Plymouth harbor, a distance of about 50 miles, while its depth inland from the middle of this base line to Boston is about 25 miles (Map: Massachusetts, F 3). Its northern shore is rocky, the southern marshy and sandy, and both are irregular and indented by numerous large and small bays, forming the harbors of Gloucester, Salem, Marblehead, Lynn, and Boston. The bay contains a number of islands along the shores, especially in the entrance to Boston harbor. The name Massachusetts Bay is sometimes made to include Cape Cod Bay.

MASSACHUSETTS HISTORICAL SOCIETY. A learned association with headquarters in Boston, the oldest historical society in the country, having been organized in 1791 and incorporated in 1794. Its objects are the collection, preservation, and diffusion of the materials for American history. The first volume of *Collections* was printed in 1792, and this has been followed by 70 more, together with 49 volumes of *Proceedings*. It has also published a new and illustrated edition of Bradford's *History of the Plymouth Plantation, 1620–1647*, in two volumes. The society has a museum of relics and antiquities and a fine library of nearly 60,000 volumes, 120,000 pamphlets and broadsides, a large collection of rare manuscripts made by the late Francis Parkman relating to the history of the French in Canada, and the Winthrop collection of manuscripts relating to early New England history.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY. A school of industrial science in Boston, Mass., established in 1861 through the efforts of W. B. Rogers and others, "for the purpose of instituting and maintaining a society of arts, a museum of arts, and a school of industrial science, and aiding generally by suitable means the advancement, development, and practical application of science in connection with arts, agriculture, manufacture, and commerce." The society of arts was the first section of the institute to be established, holding meetings since 1862, and doing much valuable work. The museum of arts has not yet been established, mainly owing to the extraordinary growth of the school of industrial science, which has overshadowed the other departments. On account of the disturbed state of the country during the Civil War the regular courses of instruction

were not opened until 1865. The institute was a pioneer in the introduction of laboratory methods, which are a distinguishing characteristic of its work. In addition to instruction in the sciences and their application to the arts, general studies essential for a liberal education are required. Fifteen distinct courses are offered, each of four years' duration: civil engineering, mechanical engineering, mining engineering and metallurgy, architecture, chemistry, electrical engineering, biology and public health, physics, general science, chemical engineering, sanitary engineering, geology, naval architecture and marine engineering, electrochemistry, and engineering administration. Some of these courses are specially adapted to certain classes of students, such as course XIII A, to which only naval constructors of the United States navy are eligible. Each course leads to the degree of B.S. Within most of the regular courses a considerable latitude is permitted in the selection of branches, a partial choice of professional course being made at the middle of the first year, while in the fourth year nearly the entire time is devoted to professional subjects. Much attention is paid to postgraduate work, with many students from other colleges who have already received degrees. As an example of the special courses provided for such students there may be noted the course in aëronautical engineering.

In 1913 an arrangement was made in coöperation with Harvard University for the maintenance of a School for Health Officers, leading to a Certificate in Public Health (C. P. H.). The studies include engineering courses from the institute curriculum and medical courses at the Harvard Medical School. At the beginning of 1914, by an arrangement made with Harvard University, the university's courses in civil, sanitary, mechanical, electrical, and mining engineering will henceforth be given in the buildings of the institute by technology instructors under the direction of the president of the institute and a faculty comprising the institute professors and those of the university departments affected by the agreement.

The school in 1914–15 had 268 instructors and a total attendance of 1816 students. The library contained 120,000 volumes and 60,000 pamphlets. The institute publishes programmes, catalogues, and reports; the Society of Arts issues *Science Conspectus;* the architectural department is responsible for the *Technology Architectural Record*, and the M. I. T. Alumni Association sends out the *Technology Review*. The students issue a daily, *The Tech*, the *Technology Monthly*, and annuals and occasionals, among the latter, *Concerning Technology*, a students' handbook. The school occupies nine buildings in the Back Bay district of Boston, comprising the Rogers, Walker, and Pierce buildings, three engineering and mechanical laboratories, boiler and power house, and gymnasium, valued with the grounds at $1,600,000. In September, 1916, the school will remove to its new plant in Cambridge on the bank of the Charles River basin, where on a plot of 50 acres there will be ready educational buildings of three and one-half acres to the floor. The Pratt School of Architecture and the student quarters, including Walker Memorial, dining hall, dormitories, and gymnasium, will be constructed on the completion of the educational portion. The value of the entire plant will be about $10,000,000. The endowment of the institute is $3,049,975, of which the income of only $1,613,498 is directly applicable to the current expenses. The income in 1914 was $705,823; of this amount more than half is derived from student fees, the remainder largely from interest on various funds and gifts from the State of Massachusetts and the United States. The presidents have been: William B. Rogers (1862–70, 1878–81); John D. Runkle (1870–78); Francis A. Walker (1881–97); James M. Crafts (1897–1900); Henry S. Pritchett (1900–07); Arthur A. Noyes (acting, 1907–09); and Richard Cockburn Maclaurin (1909–).

MASSACHUSETTS MEDICAL SOCIETY. An association with headquarters in Boston, incorporated Nov. 1, 1781, making it the oldest State organization of the kind that has met regularly from the date of founding. Its charter was signed by Samuel Adams as President of the Senate and John Hancock as Governor of the Commonwealth. Its fellows may include all respectable physicians and surgeons of the State who are graduates of medical colleges approved by its council and have been examined by its censors. In 1884 the motion was carried to admit women to membership. Its charter gave it authority to examine all candidates for the practice of medicine and surgery. The society has issued a number of valuable publications, including the *Medical Communications*, issued regularly since 1790, and the *Publications* of the Massachusetts Medical Society, a *Pharmacopœia*, and many reports, essays, a triennial catalogue since 1789, and recently an annual directory of the officers and fellows. The membership of the society in 1915 was 3500. Through its standing committees the society performs important functions in maintaining high standards in the medical profession and in favoring measures before legislative bodies for the improvement of the public health.

MASSACRE OF THE INNOCENTS. A popular subject with Italian and Flemish painters, representing the slaying of the children of Bethlehem by the soldiers of Herod. Among the most famous examples are those by Guido Reni in the Bologna Gallery; Tintoretto in the Scuola di San Rocco, Venice; Daniele da Volterra in the Uffizi, Florence; Pieter Breughel in the Vienna Gallery; and Rubens in the Munich Gallery. The scene is usually given with much realistic detail, stress being laid upon the endeavors of the mothers to save their infants.

MASSAFRA, más-sä′frà. A town in the Province of Lecce, Italy, 12 miles by rail from Taranto (Map: Italy, F 4). The principal articles of commerce are olives, wine, cotton, and fruits. Pop. (commune), 1901, 11,026; 1911, 11,104.

MASSAGE, mà-säzh′ (Fr. *massage*, from *masser*, Gk. *μάσσειν*, *massein*, to knead). A means of remedial treatment consisting in the manipulation of a part or the whole of the body by friction, stroking, pressing, kneading, percussion, and like movements. When these applications are combined with active or passive movements the process is called the *Swedish movement cure*.

The practice of rubbing and anointing is probably as old as the race. Homer alludes frequently to it. The Egyptians used it. Massage in one form or another was one of the luxuries of the baths of the ancient Greeks and Romans. Socrates spoke of the curative properties of olive

oil with friction; Hippocrates laid stress on rubbing and unguents; Asclepiades held that disease was the result of an abnormal arrangement of the atoms which form the human body, and consequently friction, bathing, and exercise would necessarily open the pores and allow the escape of all useless and worn-out atoms and restore equilibrium; Herophilus, Athenæus, Celsus, and Galen gave written rules for such treatment. The Chinese are said to use massage, in place of bleeding, on the theory of producing better circulation. Both the Turks and the Russians combine it with their baths, and their excellent practice has taken its place in our Western civilization. In one form or another massage is in vogue among most peoples, savage and civilized. In Sweden the art has been brought to a high degree of perfection, and it is practiced scientifically throughout the United States.

The manipulations in massage are divided by Metzger into four principal classes: (1) *Effleurage*, or stroking, is carried on with the palms of the hands, with the thumbs, or the tips of the fingers. It consists in lightly stroking the surface in various directions and has a soothing effect on the nervous system, increasing the superficial blood and lymphatic circulation. A procedure carried on in much the same way, but with more vigor, is (2) *Friction*. This manipulation penetrates more deeply than stroking and reaches the subcutaneous tissues and superficial muscles. (3) *Petrissage*, known also as kneading or pinching, is performed with the thumbs and fingers, or the whole hand, portions of the body, such as muscles or groups of muscles, being grasped and manipulated. (4) *Tapotement* (percussion or tapping) may be performed with the palms of the hands, or a chopping movement is made with the ulnar border of both hands. The tips of the fingers may be used with a shoving movement, and lastly the clenched fists are used to beat upon the large groups of muscles of the back of the legs and the gluteal region. General massage is carried on somewhat as follows: Beginning at an extremity, the foot, e.g., the skin is taken up between the thumb and fingers and rolled and pressed; then the muscular masses are well grasped, rolled, and pressed and kneaded, and rapidly tapped; and then each articulation is in turn put through all its motions. Even the muscles of the neck and face may be subjected to the same treatment. Massage by percussion alone consists in applying to various parts of the body a very rapid succession of short blows not forcible enough to cause pain.

The effects of massage are local and systemic. The local effects are the result of the masseur putting forth more or less muscular power, which at the points of contact or friction develops or is transformed into another mode of motion—heat. The action thus induced also serves to elevate the temperature. The blood vessels dilate and an increased quantity of blood enters them, and the motion of the blood current is accelerated. The immediate effect of these changes is to promote the nutritive energy of the tissues subjected to friction. This result is seen in the improved color, warmth, and volume of the parts. All the organic functions are performed with more energy, and power is gained in every way. The effects upon the nervous system are, in general, excellent. For instance, if an inflamed joint is rubbed with extreme gentleness, the sensibility, at first so acute that the slightest touch would give pain, rapidly subsides, until, after an hour of friction, it may be handled with some roughness, without evoking painful sensations. The acutest suffering is often alleviated by persistent friction of a gentle kind. The state of spasm of a muscle is relieved and relaxation induced by persevering rubbing of the affected muscle. These results are no doubt due to the fact that the gentle titillation of the cutaneous branches of the nerves (end organs) has so far lowered their irritability that they cease to receive and transmit painful impressions. Among the affections which may be either cured or temporarily relieved by massage are wakefulness and nocturnal restlessness, simple headache, or even severe paroxysms of neuralgia, tic douloureux, hemicrania, migraine, spinal pain, infantile paralysis, progressive muscular atrophy, chronic (nontubercular) joint affections, synovitis, contractions, deformities, and thickening from inflammatory deposits in joints and other tissues. See MOVEMENT CURE.

Consult: Ostrom, *Massage and the Original Swedish Movements* (7th ed., London, 1912); M. D. Palmer, *Lessons on Massage* (4th ed., ib., 1912); Douglas Graham, *Massage, Manual Treatment, Remedial Movements, etc.* (4th ed., Philadelphia, 1913); L. L. Despard, *Textbook of Massage* (2d ed., London, 1914).

MAS'SAGE'TÆ (Lat., from Gk. Μασσαγέται). A nomadic people, allied to the Scythians, who anciently inhabited the broad steppes to the east of the Caspian Sea. Herodotus says that they practiced group marriage; that they sacrificed and devoured their aged people; that they worshiped the sun and offered horses to him; that they lived on the milk and flesh of their herds and on fish; and that they fought on horseback and on foot with lance, bow, and double-edged axe. Cyrus the Great is said to have lost his life in fighting against their Queen, Tomyris, in 529 B.C.

MASSA'LIANS, or **MESSA'LIANS** (Gk. Μασσαλιάνοι, *Massalianoi*, from Syr. *Maṣlīn*, they who pray, from *ṣalī*, to bow). 1. A small non-Christian body in Asia Minor in the fourth century, who held a plurality of gods, but worshiped only one. The name came from the prominence of prayer in their worship. 2. A party of wandering Christian fanatics, of both sexes, who without well-recognized leaders came from Mesopotamia in the fourth and fifth centuries into Armenia, Asia Minor, and Syria, and caused great scandal by begging and their idle mode of life. They renounced marriage and believed that by means of long-continued prayer spiritual purity might be obtained. The Greeks called them Euchites.

MAS'SASAU'GA (North American Indian name). The small ground rattlesnake of the central United States. See RATTLESNAKE.

MAS'SASOIT (?1580–1661). A celebrated sachem of the Wampanoag or Pokanoket Indians, whose territory embraced nearly all the southern part of the present Massachusetts, from Cape Cod to Narragansett Bay. His tribe was said to have been very large at one time, but to have been almost exterminated by disease, so that, on the coming of the whites, it numbered only about 300. On March 22, 1621, he visited Plymouth with 60 warriors and on behalf of the Wampanoags concluded a treaty of peace and mutual protection with Governor Carver. This was sacredly kept by both sides for more than

50 years, and Massasoit himself remained the steadfast friend of the colonists until his death in 1661. He lived at Sowams, within the present town of Warren, R. I., where commissioners from the adjacent settlements often visited him. Consult Virginia Baker, *Massasoit's Town Sowams in Pokanoket* (Warren, R. I., 1904).

MASSAUA, más-sou'à, or MASSOWAH, or MASSAWA. The chief town and formerly the capital of the Italian colony of Eritrea (q.v.). It is situated partly on the mainland, partly on two small islands on the west shore of the Red Sea, 350 miles northwest of the Strait of Bab-el-Mandeb (Map: Africa, J 3). It is a fortified military station and its commercial importance is very considerable owing to its being the natural port for the northern part of Abyssinia. The climate is excessively hot. The commerce is chiefly with Arabia, Bombay, and the interior of Abyssinia, the chief exports being ivory, coffee, tobacco, wax, and ostrich feathers. Imports and exports in 1911 were valued at 18,845,118 and 9,371,802 lire respectively; transit, 5,234,262 lire. Massaua has steamship connection with Egypt, Italy, and Austria-Hungary. A railway is in operation to the capital of the colony, Asmara, 75 miles distant, and a 63-mile extension to Keren was under construction in 1914. The population was (1908) 2275 (524 Europeans), the natives being Mohammedans of various African and Asiatic races. Massaua formerly belonged to Egypt and was taken by Italy in 1885.

MASSAWA. See MASSAUA.

MASSÉ, mà'sâ', FÉLIX MARIE, called VICTOR (1822–84). A French dramatic composer, born at Lorient (Morbihan). He studied under Halévy and Zimmermann at the Paris Conservatory, and won the Prix de Rome in 1844, his composition in the competitive examination being *Le rénégat*. In 1860 he was appointed chorus master at the Opéra, and six years later became professor of composition at the Conservatory. By this time he had become one of the commanding personalities of French musical life, and in 1872 became a member of the Institute. He died in Paris, July 5, 1884. A statue of him was erected in his native town in 1887. Massé's music is distinguished for its grace and gayety and its attractive poetic quality. His best operas are: *Les noces de Jeanette* (1853); *Galatée* (1854); *La fiancée du diable* (1854); *Les saisons* (1856); *Paul et Virginie* (1876). Consult A. Pougin, *Musiciens du XIXème siècle* (Paris, 1911).

MASSEAU, mà'sō', PIERRE FÉLIX (1869–). A French sculptor, born at Lyons. He became secretary of the National Society of Fine Arts and was a member of the jury on fine arts at the Paris Exposition of 1900 and secretary for decorative art at the Milan Exposition. He was made Chevalier of the Legion of Honor and was awarded several medals. His works comprise: "The Mad Girl of the Sonnet" (1893); "Loulette" (1894); "The Secret" (1896); "Monna," marble head (Dijon Museum, 1897); "Expectation" and "The Post" (1898); "Gisèle," marble bust (1899); "Lunghino" (1901); "The Thinker" and "Beribboned Head" (1902); "Beethoven," bronze bust (1903); "Nymph," "Two Sisters," and "Winged Head" (1904); "Confidence," group (1905); "Education of the Faun" and "Bilitis" (1906); "Bathing Woman," "Leading to Joy," "Apachina" (1907); "Little Daughter of Eve" (1909).

MASSE'NA. A village in the town of the same name, situated in St. Lawrence Co., N. Y., 38 miles by rail northeast of Ogdensburg, on the Grasse and Racket rivers and on the New York Central and Hudson River and the Grand Trunk railroads (Map: New York, F 1). The town includes also Massena Centre and Massena Springs, the latter a popular watering place. Massena has a public library, and among other features of interest are the St. Lawrence Power Company's huge concrete power house and highway bridge (412 feet span and 65 feet above water). The power plant of this concern in 1901 was equipped to generate electrical energy equivalent to 35,000 horse power, and the scheme as projected admits of a very considerable expansion in the event of an increased demand, the water-power development possible here being, next to that of Niagara, the greatest in the United States. The water power is obtained by means of a canal 3 miles long, 200 feet wide, and 18 feet deep, starting at the head of the Long Sault Rapids on the St. Lawrence and emptying into the Grasse River. The chief industries are dairying and the manufacture of aluminium, Massena being the home of the Aluminium Company of America, which has an immense plant here. Settled about 1792, the town of Massena was organized in 1803. Pop., 1900, 2032; 1910, 2951.

MASSÉNA, mà'sâ'nä', ANDRÉ, DUKE OF RIVOLI, PRINCE OF ESSLING (1758–1817). A marshal of France, born at Nice, May 6, 1758. In his youth he was a ship boy in a small vessel and afterward for 14 years served in an Italian regiment in the pay of France, but left the service in 1789 because his birth precluded him from promotion. He was married and settled at Nice when the French revolutionary wars began, but he at once volunteered and soon rose to be chief of battalion. In December, 1793, he was made a general of division. He distinguished himself in the Italian campaigns of 1794–95, particularly at Loano (Nov. 23, 1795), and in 1796 was put in command of the advance guard of the Army of Italy. He won renown at Arcole (Nov. 15–17, 1796) and Rivoli (Jan. 14, 1797). Bonaparte called him "the favorite child of victory." Masséna resigned his command on account of charges of rapacity, but at the close of 1798 he was put in command of the Army in Switzerland, which operated against the allied Austrian and Russian forces. He defeated the Russians under Korsakoff at Zurich, Sept. 25–26, 1799. In 1800 he was charged with the defense of Genoa, but after an heroic resistance of nearly two months was compelled to surrender the city to the Austrians in June. After the battle of Marengo Bonaparte gave him the command of the Army of Italy. In 1804 he was made a marshal of the Empire. In 1805 he again commanded in Italy, ably manœuvring against Archduke Charles. In 1806 he compelled the surrender of Gaeta, and was largely instrumental in placing Joseph Bonaparte on the throne of Naples. After the battle of Eylau (Feb. 7–8, 1807) Masséna commanded the right wing of the French army, and after the Peace of Tilsit (q.v.) he was made Duke of Rivoli. He subsequently distinguished himself in the sanguinary battle of Aspern (Essling), in 1809, and at Wagram (q.v.) he commanded the left wing of the French army. For these services he was created Prince of Essling. In 1810 he was intrusted with the chief command in Portugal, and compelled the

British and their allies to fall back to Lisbon; but, being unable to make any impression on Wellington's strong position at Torres Vedras, he resigned his command and retired in partial disgrace. His failure he attributed to the disobedience of his lieutenants Ney, Regnier, and Junot. During the Restoration he gave his adhesion to the Bourbons. He died April 4, 1817. His *Mémoires* (7 vols., Paris, 1848–50), edited by General Koch, contain historical matter of interest and value. Consult also: Toselli, *Notice biographique sur Masséna* (Nice, 1869); Edouard Gachat, *Histoire militaire de Masséna* (Paris, 1908); G. Fitzmaurice, "Masséna," in *Royal United Service Association, Journal*, vol. lvii (London, 1913).

MASSENBACH, mä'sen-bäg, Christian von (1758–1827). A Prussian soldier, born at Schmalkalden. He studied in the Military Academy at Stuttgart; became a lieutenant in the Württemberg army in 1778; and entered the service of Frederick the Great in 1782. He accompanied an expedition to Holland in 1787 and served in the war against France in 1792–95. Chief of staff to Prince Hohenlohe in 1806, he was held chiefly responsible for the defeats at Jena and Auerstädt and for the capitulation of the Prince's army. He later took part in Württemberg politics and wrote: *Rückerinnerungen an grosse Männer* (1808); *Memoiren zur Geschichte des preussischen Staats unter Friedrich Wilhelm II und III* (3 vols., 1809–10); *Denkwürdigkeiten des preussischen Staats seit 1792* (2 vols., 1809). His writings were responsible for his trial on a charge of high treason in 1817 by the Prussian authorities, to whom he had been surrendered, and for his sentence to 14 years' imprisonment. He was pardoned by Frederick William III in 1826.

MASSENET, mâs'nâ', Jules Emile Frédéric (1842–1912). A French composer, born at Montaud (Loire). He was educated at the Paris Conservatory, where he won prizes for his pianoforte playing and for fugue writing. Subsequently he studied under Ambroise Thomas and in 1863 won the Grand Prix de Rome. In 1878 he was made professor of advanced composition at the Conservatory, which post he held until 1896, and in 1878 he was elected to the Académie des Beaux-Arts. In the latter year he made a successful tour of Great Britain. His instrumentation is especially fine, and he is a master of dainty, bizarre effects; but his music lacks real depth, though its euphony and well-defined melody make an immediate appeal, and gained for him exceptional popularity—perhaps not quite deserved when one considers the merit of some of his contemporaries. He published a volume of interesting reminiscences, *Mes souvenirs* (1912). His works include the following operas: *Don César de Bazan* (1872), *Les Erinnyes* (1873), *Le roi de Lahore* (1877), *Hérodiade* (1881), *Manon* (1884), *Le Cid* (1885), *Esclarmonde* (1889), *Le mage* (1891), *Werther* (1892), *Thaïs* (1894), *La Navarraise* (1894), *Sapho* (1897), *Cendrillon* (1899), *Le jongleur de Notre-Dame* (1902), *Ariane* (1906), *Thérèse* (1906), *Bacchus* (1908), *Don Quichotte* (1910), *Roma* (1912), and three posthumous operas *Panurge* (1913), *Cléopâtre* (1914), and *Amadis*. His other works include the cantatas *Marie Madeleine* (1873), *Eve* (1875), *La vierge*, and *Narcisse* (1878); an oratorio, *La terre promise* (1900); orchestral suites, *Scènes hongroises*, *Scènes pittoresques*, *Scènes dramatiques*, after Shakespeare, and several orchestral overtures, notably to Racine's *Phèdre;* also many collections of songs. Consult: L. Schneider, *Massenet* (Paris, 1908); H. T. Finck, *Massenet and his Operas* (New York, 1910); A. Pougin, *Massenet* (Paris, 1913).

MASSE'TER. See Jaws.

MAS'SEY, Gerald (1828–1907). An English poet, born at Gamble Wharf, near Tring, Hertfordshire, of poor parents who gave him little education. When eight years old he was placed in a silk mill, where he worked 12 hours a day. At 15 he found employment in London as an errand boy, and soon began writing verse. Stirred by the Chartist movement and the revolution of 1848, he started a weekly paper called the *Spirit of Freedom*, which was devoted to the interests of workingmen; joined the Christian Socialists, and was encouraged in his undertaking by Kingsley and Maurice. He afterward lectured on spiritualism in England, the United States, and Australia. Among his poems are: *Voices of Freedom and Lyrics of Love* (1850); *The Ballad of Babe Christabel, and Other Poems* (1854); *Havelock's March, and Other Poems* (1861); *A Tale of Eternity, and Other Poems* (1869); *My Lyrical Life* (collected poems, 1889). We may mention, also, many contributions to the periodicals, and several volumes of prose, as, *Shakespeare's Sonnets never before Interpreted* (1866); *Concerning Spiritualism* (1872); *The Secret Drama of Shakespeare's Sonnets* (1888). Massey's social verse now appears bombastic; his dramatic songs and lyrics are often sweet and beautiful.

MASSEY, Hart Almerni (1823–?1897). A Canadian manufacturer. He was born in Haldimand Township, Northumberland Co., Ontario, and was educated at Watertown, N. Y., and at Victoria College, Cobourg, Ontario (1842–44). While assisting in the management of his father's farms he resolved to devote himself to improvements in agricultural machinery, and after several years' experience in a factory started by his father at Newcastle, became sole owner in 1855. He produced the first reaping and mowing machines made in Canada, and by a number of notable improvements brought the manufacture of agricultural implements in the Dominion to a high state of efficiency. He received prizes at the Paris Exhibition, and in 1876 one of his machines received the highest award at the Centennial Exhibition, Philadelphia. The business was incorporated in 1870 and in 1879 was removed to Toronto. A binder, a rake, and a harvester were added to the number of improved implements; and at Antwerp, Belgium, Massey received the highest award at the International Exhibition in 1885. The latter part of his life was noteworthy for its discriminating interest in and promotion of educational and religious work. He gave largely to missions, hospitals, libraries, churches, and educational institutions, especially to Victoria University.

MASSI, mäs'sē, Gentile. An Italian painter. See Gentile da Fabriano.

MAS'SICOT (Fr. *massicot*, from *masse*, Lat. *massa*, mass, lump, from Gk. *μᾶζα*, *maza*, barley cake, from *μάσσειν*, *massein*, to knead). A natural lead monoxide, yellow in color. It is found massive, usually with a crystalline and shining surface, which, when broken, shows a scaly texture. Artificial crystals of massicot have been obtained among furnace products and by direct chemical methods.

MASSIL'IA. See MARSEILLES (towards the end).

MASSILIEN'SIS, JOHANNES. See CASSIANUS.

MAS'SILLON. A city in Stark Co., Ohio, 72 miles by rail south of Cleveland and 8 miles west of Canton, the county seat; on the Tuscarawas River, the Ohio Canal, and the Pennsylvania, the Wheeling and Lake Erie, the Northern Ohio Traction and Light Company, and the Baltimore and Ohio railroads (Map: Ohio, G 4). It is the centre of the noted Tuscarawas Valley coal field, and in its vicinity are several quarries of valuable white sandstone. The industrial plants produce extensively farming implements and machinery, stationary and portable engines, iron bridges, bar iron, glass bottles, stoves and heating furnaces, silos, steel washers, steel sheets, wire baskets, power-plant specialties, steam hammers, fire and paving brick, aluminium and enameled ware, paper, and steel tubing and pipe. In Massillon are the State Hospital and Asylum for the Insane, a city hospital, and a public library, besides several parks. Massillon was founded in 1825, was incorporated as a village in 1853, and was chartered as a city in 1868. The government is administered by a mayor, elected biennially, a unicameral council, and directors of service and safety, who, with the mayor (by whom they are appointed), constitute a board of control. The board of education is independently elected by popular vote. Pop., 1890, 10,092; 1900, 11,944; 1910, 13,879; 1914 (U. S. est.), 14,912; 1920, 71,428.

It was named by Mrs. James Duncan after Father Jean Baptiste Massillon (q.v.), the noted French divine.

MASSILLON, mȧ'sē'yôn', JEAN BAPTISTE (1663–1742). A distinguished French bishop and preacher, born at Hyères, June 24, 1663. He entered the Congregation of the Oratory in 1681, and while engaged in teaching theology in the diocese of Meaux he delivered an eloquent funeral oration on the Archbishop of Vienne, which led to his being called to Paris and placed at the head of the seminary of Saint-Magloire. There a course of conferences, delivered in the seminary, established his reputation. He was twice called to preach in the presence of Louis XIV at Versailles. He preached funeral orations on the Prince of Conti, the Dauphin, and Louis XIV. In 1717 Massillon was named Bishop of Clermont, and was appointed to preach before the young King Louis XV, for which occasion he composed his celebrated *petit carême* —a series of 10 sermons. In 1719 he was consecrated Bishop and was elected a member of the French Academy. After 1723 he lived almost entirely in his diocese of Clermont, where his charity, gentleness, and amiable disposition gained him the affections of all. His works, consisting mainly of sermons and other similar compositions, were collected in 15 volumes, by his nephew, and published in 1745–46; later editions have appeared in great numbers, the best being that of the Abbé Guillon (Paris, 1828) and that of Blampiguan (ib., 1886). The latter has also published a biography, *Massillon d'après des documents inédits* (ib., 1879).

MAS'SINGBERD, FRANCIS CHARLES (1800–72). Chancellor of Lincoln. He was born in Lincolnshire; was educated at Rugby and at Magdalen College, Oxford, and, after graduation with high honors, entered the Church and in 1825 became rector of South Ormsby in his native county. He was made a prebendary in Lincoln Cathedral in 1847 and chancellor in 1862. As chancellor he strove to improve the practical efficiency of the cathedral. He was early and prominent in the movement for the restoration of the deliberative functions of convocation, with reference to which he published in 1833 *Reasons for a Session of Convocation.* In addition to many papers and discussions on ecclesiastical subjects he was the author of: *Church Reform* (1837); *The Educational and Missionary Work of the Church in the Eighteenth Century* (1857); *History of the Leaders of the English Reformation* (1842; 4th ed., 1866); *The Law of the Church and the Law of the State* (1859); *Lectures on the Prayer-Book* (1864); *Sermons on Unity, with an Essay on Religious Societies* (1868).

MASSINGER, mȧs'sin-jẽr, PHILIP (1583–1640). An English dramatist, son of Arthur Massinger, a retainer of Henry Herbert, second Earl of Pembroke. The elder Massinger was educated at St. Alban Hall, Oxford; was afterward a fellow of Merton College and member of Parliament. Philip entered St. Alban Hall in 1602, but he left without a degree in 1606, the year in which his father probably died. Massinger went to London, probably not before 1610, and began writing for the stage. The extent of his work has not been definitely determined, for he collaborated on a large scale. He seems to have written single-handed about 15 plays, and in conjunction with others fully 25. His most common collaborator was Fletcher; and certain of the plays they wrote together must be sifted from those that have long passed under the name of Beaumont and Fletcher. Massinger studied his art well, and skillfully adjusted his plays to the stage. In the art of construction, indeed, he ranks high. As much cannot be said for his characterization, which is stiff and unnatural and distorted by the obvious determination of the dramatist to bend the creatures of his fancy to fit a moral aim and the illustration of ethical problems. His best-known comedy, *A New Way to Pay Old Debts* (first performed between 1622 and 1626), kept the stage well on into the nineteenth century. Sir Giles Overreach, the leading character in the play, is without much doubt a portrait of a notorious extortioner of the time named Sir Giles Mompesson. Political satire is one of the characteristics of Massinger's plays, particularly of *Believe as you List, The Emperor of the East, The Maid of Honour,* and *The Bondman.* In the last-named play (performed late in 1623 or early in 1624), the object of attack is Buckingham. Good examples of Massinger's power are *The Virgin Martyr* (partly Dekker's) and *Barnavelt* (partly Fletcher's). Through his life he kept up friendly relations with the Herberts. From Philip, the fourth Earl of Pembroke, he received, it is said, a pension of £30 or more. He died at Southwark, in March, 1640, and was buried in the churchyard of St. Saviour's. There is no satisfactory edition of Massinger. The best is by William Gifford (4 vols., 1805; second ed., 1816; reprinted by Cunningham, 1867). Consult also *Dramatic Works of Massinger and Ford,* edited by Hartley Coleridge (London, 1840; rev., 1883), *Selected Plays,* edited by Arthur Symons, for "Mermaid Series" (ib., 1887–89); and for Massinger's share in plays ascribed to Beaumont and Fletcher, *Transactions of New Shakespeare Society* (London, 1880–86); F. G. Fleay in the last-named publication (ib., 1874); *Biographi-*

cal Chronicle of the English Drama (ib., 1891); A. W. Ward, *History of English Dramatic Literature to the Death of Queen Anne* (New York, 1899); Leslie Stephen, *Hours in a Library* (3d series, ib., 1905); Emil Koeppel, in *Cambridge History of English Literature*, vol. vi (Cambridge, 1910).

MASSINISSA. See MASINISSA.

MASSMANN, mäs'mȧn, HANS FERDINAND (1797–1874). A German philologist, well known for his studies in Old German language and literature. Born in Berlin, he studied there, and, after serving in the War of Liberation, in Jena, where his radical ideas and "demagogic" sympathies brought him into difficulties with the authorities. In 1826 he became a teacher at the Royal Gymnastic Institute at Munich and afterward was chosen professor of Old German literature at the university. At Berlin, whither he had gone in 1842 to introduce gymnastics into the Prussian service, he accepted the chair of Germanic philology. Massmann's writings include editions of *Deutsche Gedichte des 12. Jahrhunderts* (1837–42); Gottfried's *Tristan* (1843); *Kaiserchronik* (1849–53); of the biblical translations of the Gothic Bishop Ulfilas (1855–56) and of Tacitus's *Germania* (1847); *Geschichte des mittelalterlichen Schachspiels* (1839); *Litteratur der Totentänze* (1840). Consult article in *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884), and Euler and Hartstein, *H. F. Massmann: sein Leben, seine Turn- und Vaterlandslieder* (Berlin, 1897).

MASSON, mȧ'sôn', ANTOINE (1636–1700). A French line engraver, born at Louvry, near Orléans. He learned engraving as an armorer's apprentice and had no other teaching. He engraved 68 plates, mostly portraits, of which the most celebrated are those of Count d'Harcourt, known as the "Cadet à la Perle," Gaspard Charrier, and Olivier d'Ormesson. "The Pilgrims of Emmaus," after Titian, known as "The Tablecloth" because of the extreme care with which Masson has rendered the texture of linen, is his most famous subject. His work shows extraordinary facility and great talent for color, but it is often marred by mannerisms.

MAS'SON, DAVID (1822–1907). A Scottish author, born at Aberdeen, Dec. 2, 1822. He was educated at Marischal College, Aberdeen, and at the University of Edinburgh. At 19 he became editor of a Scottish provincial paper. In 1847 he settled in London. He was editor of *Macmillan's Magazine* from 1858 to 1865. In 1852 he succeeded Clough in the chair of English literature at University College and in 1865 retired to accept the professorship of rhetoric and English literature in the University of Edinburgh. In 1893 he became Historiographer Royal for Scotland. Masson is widely known for his studies in Milton, comprising the exhaustive work, *The Life of Milton in connection with the History of his Time* (6 vols., 1859–80; first volume enlarged 1881; index, 1894), and at least four editions of his poems: the Cambridge edition (3 vols., 1874), revised as the Cabinet edition (1890); the Golden Treasury edition (2 vols., 1874), the Globe edition (1 vol., 1877), an intermediate between the Cambridge and the Golden Treasury (3 vols., 1822). The same careful scholarship is displayed in lives of Drummond of Hawthornden (1873) and De Quincey (1878), and in an edition of De Quincey's works (14 vols., 1889–91). Among Masson's other writings are: *Essays, Biographical and Critical* (1856; reprint, with additions, 1874–76); *British Novelists* (1859), an excellent piece of criticism; *Recent British Philosophy* (1865); *Carlyle Personally and in his Writings* (1885); *Edinburgh Sketches and Memories* (1892). From 1880 to 1899 he edited, with introductions, the *Register of the Privy Council of Scotland*, vols. iii–xv (1578–1627).

MASSON, mȧ'sôn', FRÉDÉRIC (1847–). A French historian, born at Asnières. He became librarian of the Ministry of Foreign Affairs and in 1903 was elected to the French Academy. He is particularly known as the historian of the life and times of Napoleon, his writings including: *La révolte de Toulon en prairial an III* (1875); *L'Impératrice* (1877), anonymously; *Le Marquis de Grignan* (1881; 3d ed., 1908), crowned by the French Academy; *Les diplomates de la Révolution* (1884); *Napoléon et les femmes* (1893; 21st ed., 1897), translated as *Napoleon and the Fair Sex* (1894); *Napoléon chez lui* (1894); *Les cavaliers de Napoléon* and *Napoléon inconnu* (1895); *Marie Walewska* (1897); *Joséphine de Beauharnais, 1763–1796* (1899); *Joséphine, impératrice et reine* (1898); *Joséphine, répudiée 1809–1814* (1901); *L'Impératrice Marie-Louise* (1902); *Napoléon et son fils* (1904); *Napoléon et sa famille* (9 vols., 1897–1907); *Le sacre et le couronnement de Napoléon* and *Autour de Sainte-Hélène* (1908); *Sur Napoléon* (1909); *Napoléon à Sainte-Hélène, 1815–1821* (1912); *L'Académie-Française, 1629–1793* (1912); *Pour l'Empéreur* (1913).

MASSON, LOUIS FRANÇOIS RODRIGUE (1833–1903). A Canadian statesman, born in Terrebonne, Quebec. He was educated at the Jesuit College, Georgetown, D. C., and at St. Hyacinthe College, Province of Quebec. In 1859 he was admitted to the bar and he sat in the Canadian Parliament as Conservative member for Terrebonne from 1867 to 1882. From 1878 to 1880 he was Minister of Militia and Defense, in 1880 was President of the Council, and from 1884 to 1887 was Lieutenant Governor of Quebec Province. As Minister of Militia and Defense, he procured the passage of a law establishing cadet companies in the universities, colleges, and high schools of the Dominion. In 1882 and again in 1892 he was summoned to the Senate. He was mayor of Terrebonne and published *Les bourgeois de la compagnie du Nord-Ouest* (1889).

MAS'SON, THOMAS LANSING (TOM MASSON) (1866–). An American editor and author, born at Essex, Conn., and educated in the public schools of New Haven. Engaging in journalistic work in New York, he became literary editor of *Life* in 1893 and a regular contributor of humorous articles to various magazines. As an editor, he was responsible for *Humorous Masterpieces of American Literature* (1904); *In Merry Measure* (1905); *The Humor of Love in Verse and Prose* (1906); *The Best Stories in the World* (1914). His own books are: *The Yankee Navy* (1899); *A Corner in Women* (1905); *The Von Blumers* (1906); *A Bachelor's Baby and Some Grown-Ups* (1907).

MASSON-FORESTIER, mȧ'sôn'-fô'rĕs'tyā', ALFRED (1852–1912). A French writer, born at Havre. He studied law and from 1884 to 1899 practiced his profession at Rouen. After 1899 Masson-Forestier settled in Paris and devoted all his time to literature, contributing to the *Revue des Deux Mondes*, *Temps*, *La Revue* etc. His stories, usually short and in content

sober, are reminiscent of Merimée and Maupassant. He wrote: *Difficile devoir* (1891); *Pour une signature, etc.* (1892); *La jambe coupée, etc.* (1894); *Remords d'avocat* (1896), crowned by the French Academy; *Angoisses de juge, etc.* (1898); *Une flambée d'amour* (1900); *A même la vie* (1901); *L'Attaque nocturne* (1903). Among his dramas may be mentioned: *Médecin de campagne* (1901); *Attaque nocturne* (1905), with A. de Lorde; *Baraterie* (1906); *Le droit du père* (1907), with J. Monnier. The last years of his life were spent in a study of Racine and he published in 1911 *Autour d'un Racine ignoré.*

MASSO'RA, or **MASSORETH.** See MASORA.

MASSOWAH. See MASSAUA.

MASSYS, QUINTEN. See MATSYS, QUINTEN.

MAST (AS. *mæst*, OHG. *mast*, Ger. *Mast;* probably connected ultimately with Lat. *malus*, pole). In sailing vessels a mast is an upright spar on which sail is set. In large ships masts are in several lengths. In fore-and-aft-rigged vessels the mast is commonly in two parts, called the lower mast and the topmast; in large square-rigged vessels the masts are in three sections, the lower mast, topmast, and topgallant mast. That part of the topgallant mast above the eyes of the topgallant rigging and below the royal rigging is called the royal mast; if skysails are carried the part of the topgallant mast above the eyes of the royal rigging is called the skysail mast or skysail pole.

Large lower masts are either of iron or steel or built up of many timbers whose edges meet in radial planes. These timbers are bolted together and further held by circular bands of iron or steel. They are joined to the timbers above and below by scarfs and the scarfs break joints (i.e., no two scarfs are abreast each other horizontally).

The parts of a mast are the head, hounds, body, partners, and heel. The head is the upper part; the hounds are the enlarged parts just below the eyes of the rigging; the body is the part between the hounds and the deck; the partners the portion which passes through a deck; and the heel is the lower end. Lower masts alone have partners (since the upper masts do not pass through decks) and they have tenons at the heel which fit in the mast step on the keelson. They are held in position by wedges at the partners and by the rigging. Of the latter, the shrouds lead from the masthead just above the hounds to each side of the ship, where they spread out fanwise and sustain the mast against thwartship pressure; the stays lead from the masthead forward along the centre line of the ship, furnishing strength in that direction; while the backstays, also descending from the masthead, extend to the sides of the ship abaft the shrouds to resist the forward pull of the sails. Upper masts have similar rigging, but the lower ends are secured differently. The heel passes through a hole in a heavy iron-bound wooden block called a cap, which is secured to the head of the lower mast, and extends downward to the trestletrees, between which it passes and to which it is secured by a heavy piece of wood or iron, called a fid, passing through the mast and trestletrees or simply resting on the latter, the heel extending beyond the fid hole far enough to be held from horizontal movement by a framed hole between the trestletrees. On the head of the uppermost mast there is usually placed a small disk of wood called the truck, which has sheaves or holes for signal halyards.

Upper masts and the lower masts of schooners and of other fore-and-aft-rigged craft are (when the masts of the latter are not of iron) almost invariably of one stick, the sliding of yards and of the hoops of fore-and-aft sails being interfered with if bands are used. When masts are large and made of a single stick they form no inconsiderable item in the equipment of a ship, for they must be straight, free from blemishes, cracks, deep-seated knots, etc. They are usually of pine, spruce, or fir, which woods combine lightness with strength in addition to other desirable qualities.

As regards position in a ship masts are variously named. In two-masted vessels the forward is called the foremast, the after one the mainmast. In three-masted ships the forward one is the foremast, the middle one the mainmast, the after one the mizzen or mizzenmast. When there are four masts, all large, they are called the foremast, forward mainmast, after mainmast, and mizzen; if the after mast is small, they are called the foremast, mainmast, mizzen, and jigger. When the masts exceed four in number there is no fixed rule for naming.

The masts of large modern steamers and men-of-war are used for signal and lookout purposes. They are of many types, especially in men-of-war. The battleships of the United States navy are fitted with tall circular structures built of steel tubing which have the appearance of openwork or cage towers. The broad bases of these "cage" masts obviate the necessity of stays and the numerous elements permit them to withstand the hits of many projectiles without collapsing or falling. In the British navy and some other services tripod masts are fitted. The masts of large war vessels usually carry one or more observation or searchlight platforms, but fighting tops are no longer fitted on masts nor are guns mounted in any way upon them. See SHIP; SHIP, ARMORED; SHIPBUILDING.

MAS'TABA. An Arabic word of uncertain derivation, meaning a bench, applied by Mariette to Egyptian tombs of a type which prevailed under the Memphite dynasties of the ancient Empire. Many hundreds of these tombs exist in the great necropolis between Abu Roash and Dashur, especially at Gizeh and Saqqara. They are oblong, benchlike structures with flat roofs of stone and walls of sun-dried brick or of stone, having a slight inclination or batter inward. They vary in size from 19 by 25 feet to 84 by 172 feet, and are carefully oriented, with the long axis set north and south. Upon this axis an opening in the roof marks the mouth of the burial shaft, which leads to the mummy chamber, cut in the rock at a depth of some 40 feet. The mastaba itself is sometimes solid, sometimes chambered. The solid mastaba has upon its eastern face a rectangular recess, containing an inscribed stele. In the chambered mastaba a doorway set in a recess, which in the more important examples forms a spacious vestibule or porch fronted by twin piers, gives access to the chamber or chapel. This is often richly adorned with mural paintings, designed for the delectation of the *ka*, or disembodied double of the deceased, and invariably possesses on its western wall an inscribed stele and a sculptured door, through which the *ka* might eventually pass to the land of the Sun of Night. From this chamber also small openings lead to the *serdabs*, or secret chambers containing the *ka* statues, by means of which the *ka* was supposed to retain

his or her identity while confined in the limbo of the tomb. Sometimes these openings are wanting, the *serdabs* being hermetically sealed. The chapel was open to any one to enter. Consult: Perrot and Chipiez, *Histoire de l'art dans l'antiquité*, vol. i (Paris, 1882); A. E. Mariette, *Les mastabas de l'ancien empire* (ib., 1881–87); Adolf Erman, *Life in Ancient Egypt* (New York, 1894); Georges Bénédite, "Les origines du mastaba," in *Musée Guimet, Annales*, vol. xxx (Paris, 1908). An excellent model of a mastaba, showing internal arrangements, is illustrated in the *Bulletin of the Metropolitan Museum of Art*, vol. viii (New York, 1913).

MAS'TER (OF. *maistre*, Fr. *maître*, from Lat. *magister*, leader; connected with *magnus*, Gk. μέγας, *megas*, great). The proper designation of the commander of a merchant vessel. The courtesy title of captain which is generally accorded him is a military designation properly belonging to the naval service only. The rank of master existed in the United States navy and was the title of an officer next junior to lieutenant. It was the survival of the term "sailing master," which in turn was a relic of the days when ships were commanded and fought by soldiers but navigated and manœuvred by the sailing master and his crew of seamen. The Act of Congress of August, 1882, changed the title of master to that of lieutenant (junior grade).

MASTER AND SERVANT. In its broadest sense, persons in such a relation that one is employed to work for and represent the other. Modern law, however, distinguishes the employee who is engaged to represent his employer in business transactions involving the making of contracts on the employer's behalf from others, and designates him as agent (q.v.). This article will be confined to the law of master and servant in its narrower sense—to the rules governing the relation of persons where one is employed to render service for the other but not to bind him by contract.

Formerly servants were classified as voluntary and involuntary, the latter including slaves and apprentices (see APPRENTICE). As slavery, or involuntary servitude, has, except as a punishment for crime, disappeared from every common-law jurisdiction, and as apprenticeship has largely lost its importance, only voluntary servants will be here considered. Eminent legal writers hold that some of the rules governing master and servant to-day "can only be explained by going back to the time when servants were slaves." For example, it is said the genesis of the master's extraordinary liability for acts of his servant which he has neither commanded nor approved is found in the right of the ancient master to surrender the slave who has injured another. This and similar views, however, have not been sufficiently established.

The modern servant becomes such as the result of an agreement with the master which either party may break at will, subject only to the usual consequence that the party in the wrong is liable to pay damages for the breach of contract. If the contract is not to be performed within a year after it is made, it is required by the Statute of Frauds (q.v.) to be in writing. If, however, it be for an indefinite period, which may end within a year after the agreement is entered into, no writing is necessary. Thus, a contract of service, to continue indefinitely during the life of either party thereto, may be made orally, since it may terminate within a year after it is made. And even when an oral agreement is made for a term longer than a year, if the master receive and accept services rendered by the servant and then refuse to go on and complete the contract, the latter may recover, in an action in quasi contract, technically called a *quantum meruit*, the value of the labor he has thus performed. When the services continue for a year, and after its expiration the servant remains in the same employment without any further expressed agreement, a renewal of the contract for another year and upon the same terms is presumed. In the absence of special contract as to the time of service it is sometimes difficult to determine whether the hiring is for a year or for a shorter period, such as a month, week, etc. The common instance of the hiring of farm hands, in which each of the interested parties had a right, in the absence of any contract stipulations, to assume that the services would continue through the four seasons, gave rise to the presumption, which came to be applied to most contracts of hiring in England, that if no time were specified an agreement was meant to last for one year. But this presumption is easily overcome by slight evidence of facts and circumstances which indicate a contrary intention. Thus, the period for which the wages are to be paid, as by the quarter, month, week, etc., will frequently be decisive in proving the hiring to be for a year, a month, a week, etc., as the case may be. And it may be laid down as the general rule in the United States that where the contract is silent as to the term of service and there is no well-defined usage in the particular community on the subject, the hiring is terminable at the will of either party.

After the relation has been duly constituted we have to consider (1) the mutual duties and liabilities of the parties and (2) their respective rights and liabilities with respect to third parties.

1. Mutual Duties and Liabilities. The servant is bound to have competent skill for the service which he undertakes, to exercise due diligence in his work, to obey all lawful orders of his master concerning the labor for which he was engaged, to conduct himself respectfully, and not to leave his employment during the time for which the contract was made. If he leave the master without just cause during the stipulated time, he cannot recover unpaid wages for the services already rendered, and if he be rightfully discharged he forfeits his wages for the period during which he has served without payment. But if he be prevented by sickness from completing his part of the contract, he may recover for the value of the services which he has rendered. If his unjustifiable breach of contract result in damage to his employer he is liable therefor. In some cases servants may be enjoined by the courts from breaking their contracts of service. (See CONSPIRACY; STRIKE.) Some of the grounds on which a servant may be lawfully discharged before the expiration of his term are gross immorality, willful disobedience of orders, habitual negligence, and glaring incompetence to perform his duties. If during his term he be discharged unjustly and without sufficient cause, he may either treat the contract as rescinded and sue for the value of the services already rendered, or he may sue for the breach of the contract and in that action recover both the value of the services already rendered and

the compensation for the damages sustained by him because of his wrongful discharge. But it is always his duty, during the residue of the term for which he was employed, to seek for other employment of a similar character in the same locality, in order to reduce as much as possible the damages recoverable against his master. If he do not thus seek and accept such similar employment as he may be able to obtain, the master may show that fact, in mitigation of damages, in the action brought by the servant for the breach of the contract. If, after the contract is made, the master neglect or refuse to furnish work pursuant thereto, the servant may recover as damages the entire amount of the stipulated wages, if he have duly held himself in readiness to perform and been unable by reasonable effort to obtain other employment of a similar character. If he sue, however, before the expiration of the stipulated time and recover damages up to the time of trial, he will be thereby barred or precluded from maintaining any further action for subsequently accruing damages. This results from the principle that a contract for work and services is entire, and its breach gives only one right of action. When a servant becomes sick the master is generally under no obligation to supply him with medical attendance; but an implied contract to pay for the services of a physician who is called in is frequently fastened upon the master from the fact that he has the physician called and otherwise acts as if he were assuming the obligation.

While, as a rule, the servant takes upon himself all the ordinary risks incident to the employment, still the master is under a legal obligation to use reasonable and ordinary care to supply the servant with safe machinery and appliances with which to work; and if, because of the master's failure to perform the duty properly, the servant be injured, without any contributory negligence on his own part, he may recover, in an action against his master, compensation for the damages thus sustained. If the servant be employed upon work involving special risks, of which he cannot be presumed to be cognizant, it is the duty of the master to inform him of such risks, or the master will be chargeable with negligence. Where the labor is in connection with specially dangerous machinery—such, e.g., as that used by railroad companies—the courts require the master to have the same very carefully inspected, to see, as far as is reasonably possible, that it is safe; but even in such cases they do not go to the extent of making the master an insurer of the servant's safety in the use of such machinery. If a servant be aware of the dangerous character of the place in which, or machinery or tools with which, he is requested by the master to work, and continue in his employment without objection on that ground, he cannot recover damages from the master for an injury which results from any such cause. If the master willfully injure the servant, or by his personal neglect or wrongful act cause him injury in other ways than through defective machinery, place of labor, or implements of toil, he is liable to such servant in damages. In entering upon his employment the servant also voluntarily takes the risk of injury which may result from the negligence or wrongful acts of his fellow servants (q.v.), except in cases coming within the provisions of modern statutes relating to employers' liability (q.v.).

Although it is customary for the master to give a testimonial of character to an honest and capable servant at the termination of his employment, he is not legally bound to do this, in the absence of a contract or a well-defined usage therefor.

2. **Their Rights and Liabilities with Respect to Third Parties.** The master is entitled to the services of his servant in accordance with the contract of hiring. He may, therefore, justify an assault necessarily made in defense of his servant and may have an action for damages against any one who wrongfully beats or injures the servant so that his services are lost or impaired. So if any one entice away the servant and thereby cause loss to the master, the latter may recover in an action the damages for the injury thus sustained. If a female servant be seduced, her master may sue for consequent loss of services.

For his acts of negligence or positive wrong which result in injury to others a servant is, of course, personally liable. But since he is so often pecuniarily irresponsible, the question most frequently litigated is that of the extent of his master's liability for such acts. The general statement of the rule is that the master is liable for the wrongful acts or torts of his servant which are within the scope of his employment and which cause injury to third persons. Even though the act of the servant be a willful wrong, yet when it is done in connection with the master's business or in furtherance thereof, it may make the latter liable for injury thereby occasioned to third parties. But when the servant leaves and loses sight of his master's business, and wantonly does a wrongful act, he alone is liable for consequent injury to others. When a servant creates a nuisance upon his master's premises, whereby injury is caused to adjoining property, and when a servant prevents his master from performing a contract by which the latter is bound, the master is liable, even though the act of the servant were willful and malicious. So a carrier of passengers is bound to protect them from injury resulting from the violence or insults of his own servants, and will be liable if while passengers they be thus injured.

For important statutory changes in the law of master and servant, see COMBINATION; CONSPIRACY; EMPLOYERS' LIABILITY; FELLOW SERVANTS; LABOR LEGISLATION; STRIKES. Other statutes have for their objects the prevention of the employment of young children in certain lines of work; securing the payment of wages in money and at stated times; limiting the hours of labor which masters may require of their servants; and the like.

Bibliography. Holmes, *The Common Law* (Boston, 1881); James Kent, *Commentaries on American Law* (ib., 1896); Huffcut, *Agency, Including the Law of Master and Servant* (ib., 1901); Reinhard, *Agency, Including Master and Servant* (Indianapolis, 1902); F. F. Dresser, *Employers' Liability* (St. Paul, 1902); Pollock and Maitland, *History of English Law* (2d ed., Cambridge, 1903); C. B. Labatt, *Commentaries on the Law of Master and Servant* (Rochester, 1904); C. M. Smith, *A Treatise on the Law of Master and Servant* (6th ed., Toronto, 1906); John Macdonnel, *Law of Master and Servant* (2d ed., ib., 1908); J. D. Wilkinson, *Personal Injuries and Somewhat of the Relation of Master and Servant* (New Orleans, 1909).

MASTER-AT-ARMS. A petty officer in the navy who forms one of the police of a ship. In the United States navy there are four grades of masters-at-arms—chief master-at-arms and masters-at-arms of the first, second, and third class. Large ships have one or more chief masters-at-arms and several of the lower ratings. In small ships a first or second class master-at-arms is the chief of the ship's police.

MASTER BUILDER, The. A drama by Ibsen (1893). The original title is *Master-Builder Solness.*

MASTER HUMPHREY'S CLOCK. Tales by Charles Dickens which appeared in a weekly of this name. "Old Curiosity Shop" and "Barnaby Rudge," purporting to have been narrated by Master Humphrey, were the stories. They were subsequently published separately.

MASTER IN CHANCERY. An officer of a chancery or equity court, appointed to assist the chancellor or judge. The office is one of great antiquity. Formerly the masters were assistants or associates of the chancellor and the Master of the Rolls and sat with them in court by turns, usually two at a time. In later times, however, this practice was discontinued and the duties of masters confined to business transacted in chambers, some of their duties being purely ministerial and administrative and some of a judicial character. It was common practice to refer causes to a master for hearing, particularly causes involving intricate accounts and requiring computation. A master is often appointed to examine witnesses, to take depositions, to inquire into and report the facts of a case to a chancellor or judge of the court, to make settlements under deeds, to discharge special duties under the direction and in behalf of the court, etc. Masters in chancery were formerly clerks in chancery, 11 in number, besides the Master of the Rolls, who was their chief. They were at first called *preceptores,* but in the reign of Edward III came to be known as masters in ordinary. The office has been abolished in England, the duties formerly belonging to masters being now discharged by judges or registrars and by masters of the Supreme Court. In most of the United States the office still exists, the officer being sometimes called a master and sometimes commissioner (q.v.). See Master of the Rolls; Masters of the Supreme Court; Referee.

MAS'TERMAN, Arthur Thomas (1869–). An English zoölogist, born at Tunbridge Wells, a brother of C. F. G. and J. H. B. Masterman. He was educated at Weymouth and at Christ's College, Cambridge. At St. Andrews he was assistant professor of natural history in 1893–99 and at Edinburgh lecturer on biology and zoölogy at the School of Medicine in 1900–03. In 1903 he became superintendent inspector to the Board of Agriculture and Fisheries, and from 1905 to 1912 he was British Government expert to the International Council for the Study of the Sea. With W. C. McIntosh, of St. Andrews, he wrote the valuable *Life-Histories of the British Marine Food-Fishes* (1897), and alone he made many contributions to technical periodicals and published an *Elementary Text-Book of Zoölogy* (1901–02).

MASTERMAN, Charles Frederick Gurney (1873–). An English publicist and author, born in Sussex, a brother of A. T. and J. H. B. Masterman. He distinguished himself as a student at Christ's College, Cambridge, of which he became a fellow in 1900. After leaving the university he became known as a contributor to the London weeklies and magazines and as literary editor of the *Daily News.* He was connected with London poor-work administration and acted as lecturer for the Cambridge and London University Extension societies. As a Liberal, he sat in Parliament for West Ham from 1906 to 1911 and for South-West Bethnal Green thereafter till 1914. In 1909–12 he was Undersecretary of State, Home Department, and in 1912–14 Financial Secretary to the Treasury. In 1914 he was appointed Chancellor of the Duchy of Lancaster, but resigned the next January. He wrote: *Tennyson as a Religious Leader* (1899); *The Heart of the Empire* (1901); *From the Abyss* (1902); *In Peril of Change* (1905); *The Condition of England* (1909); *Modern Industrialism* (1912).

MASTERMAN, John Howard Bertram (1867–). An English clergyman and historian, brother of A. T. and C. F. G. Masterman. He was educated at Weymouth College, at University College School, and at St. John's College, Cambridge, where he was lecturer and Naden divinity student in 1894–96. He was for three years a university-extension lecturer and vicar of St. Aubyn's, Devonport. Then for 10 years he was in Birmingham, being principal of the Midland Clergy College (1899–1901), warden of Queen's College (1902–07), canon of Birmingham (1906–07), and professor of history in the university (1902–09). He was afterward canon of Coventry and rector of St. Mary-le-Bow Church, Cheapside. Masterman served as Hulsean lecturer at Cambridge in 1907–08. He published: *The Age of Milton* (1897), *Introduction and Notes to the First Epistle of St. Peter* (1900), *Was Jesus Christ Divine?* (1904), *I Believe in the Holy Ghost* (1906), *Rights and Responsibilities of National Churches* (1908), *The House of Commons* (1908), *Parliament and the People* (1909), *The Dawn of Mediæval Europe* (1909), *History of the British Constitution* (1912), *The Challenge of Christ* (1913).

MASTER OF ARTS. A degree conferred by colleges and universities. In those of the United States and Great Britain this title follows that of Bachelor of Arts. In the United States a corresponding master's degree follows a bachelor's degree in science, philosophy, or other baccalaureate designations and indicates a year's study beyond the baccalaureate course. The master's degree is the highest in the faculty of arts, but inferior to that of bachelor of divinity and the doctorate of philosophy. In the early universities the mastership or licentiate, as it was then called, was the one degree conferred, the baccalaureate then being a mere preliminary degree, and the doctorate being either a synonymous term or one used to indicate the ceremonial and official aspect of the licentiate. It is still the first degree conferred in the Scottish universities. In the universities of Germany the terms "mastership" and "doctorate" are yet sometimes used as synonymous. In the British universities the degree of Master of Arts is the highest degree taken by the majority of students, although the doctor's degree whether by research or examination is becoming more common, especially in the newer universities. At Oxford and Cambridge the M.A. degree is open without examination to those who hold the B.A. after a period of years on paying the necessary fees. The chief value of the degree at these univer-

sities, except that it indicates a certain standing, is that it is accompanied by the privilege of voting in Congregation at Oxford and the Senate at Cambridge, a privilege which on more than one occasion has led to the defeat of progressive measures by the large body of masters of art who are nonresident and often out of touch with the actual educational needs of the universities and the country. See BACHELOR'S DEGREE; DEGREE: UNIVERSITY.

MASTER OF THE BUCKHOUNDS. In Great Britain, an officer in the Master of the Horse's department of the royal household, who, with the hereditary lord falconer, has the control of all matters relating to the royal hunts. A salary of £1500 is attached to the office, which is regarded as one of considerable political importance. The Master of the Buckhounds goes out of office on a change of ministry.

MASTER OF THE HORSE. In Great Britain, an officer of the court who has the superintendence of the royal stables and of all horses and breeds of horses belonging to the sovereign. He has the privilege of making use of the royal horses, pages, and servants, and rides next to the sovereign on all state occasions. The Master of the Horse is appointed during pleasure, by letters patent; but his tenure of office depends on the existence of the political party in power. The office was an important post under the Byzantine emperors, where the count of the royal stables, the *comes stabuli*, or constable, exercised far greater powers than are conveyed by the mere title. In ancient Rome, when, in times of crisis, recourse was had to the creation of a dictator, the latter appointed a master of the horse as his chief lieutenant, corresponding to the modern chief of staff.

MASTER OF THE HOUSEHOLD. In Great Britain, an officer in the Lord Steward's department of the royal household, whose specific duties consist in superintending the selection, qualification, and conduct of the household servants. He is under the treasurer and with the comptroller examines the accounts of the department. The appointment is during pleasure of the sovereign and is not dependent upon any political party.

MASTER OF THE REVELS. An official of the English court (*Magister jocorum revellorum et mascorum*) who had charge of the royal festivities. The office came into prominence in the reign of Edward VI, though established at an earlier date.

MASTER OF THE ROLLS. The president of the chancery division of the High Court of Justice in England and in rank next to the Lord Chief Justice of England and the Lord Chancellor. He is the keeper of the rolls of all patents and grants that pass under the Great Seal and of all records of the Court of Chancery. He was originally an officer of that court and was formerly the chief of the masters in chancery. He is the only superior judge in England who can now be elected to represent a constituency in the House of Commons. The Master of the Rolls had originally the custody of the rolls or records; in the course of time this charge became merely nominal, the custody having vested in officers not in his appointment or control, an anomaly which was remedied by 1 and 2 Vict., c. 94, which restored the custody to him with extensive powers. Consult Hardwicke, *Office of the Master of the Rolls* (London, 1728); D. M. Kerly, *Historical Sketch of the Equitable Jurisdiction of the Court of Chancery* (Cambridge, 1890); Pollack and Maitland, *History of English Law* (2d ed., ib., 1903).

MASTER OF THE SACRED PALACE. See MAGISTER SACRI PALATII.

MASTER OF THE SUPREME COURT. The title given in England to the chief officers of the courts under the judges, their duty being to attend the sittings of the courts during term and make minutes of their proceedings. They also tax all the bills of costs of the parties arising out of the suits and matters before the courts and exercise many judicial as well as most of the administrative functions of the courts to which they are attached. Their duties are determined by rules of the Supreme Court. The power of appointing the masters is vested in the Lord Chancellor, the Lord Chief Justice of England, and the Master of the Rolls. There are 18 masters attached to the King's Bench Division of the Supreme Court and 16 to the Chancery Division. In the courts of the United States the duties of masters are divided between the judges and the clerks of the courts. Consult Renton and Robertson (eds.), *Encyclopedia of the Laws of England* (2d ed., London, 1908). See MASTER IN CHANCERY; MASTER OF THE ROLLS.

MAS'TERS, MAXWELL TYLDEN (1833–1907). An English botanist, born at Canterbury, England. He was educated at King's College, London, and from 1855 to 1868 was lecturer on botany at St. George's Hospital. In 1865 he became the principal editor of the *Gardener's Chronicle*. Among his general publications are: *Vegetable Teratology* (1869; in German, 1886); *Botany for Beginners* (1872); *Plant Life* (1883); *Plant Life on the Farm* (1905). *Botany for Beginners* and *Plant Life* were translated into French, German, and Russian. The Conifers were the special subject of his investigations, and many papers dealing with them appeared in various scientific serials.

MAS'TERS, THE SEVEN WISE. See SEVEN WISE MASTERS.

MASTERSINGERS. See MEISTERSINGER.

MAS'TERWORT (trans. of Neo-Lat. *Imperatoria*, fem. sing. of Lat. *imperatorius*, imperial), *Imperatoria ostruthium*. A perennial plant of the family Umbelliferæ, from 1 foot to 2 feet high, with broad biternate leaves, large flat umbels of whitish flowers, and flat, orbicular, broadly margined fruit. It is a native of the north of Europe and has been introduced in a few localities in America. It was formerly much cultivated as a potherb and was held in great repute as a stomachic, sudorific, diuretic, etc.; its virtues being reckoned so many and great that it was called *divinum remedium*. It still retains a place in the medical practice of some countries of Europe, although probably it is nothing more than an aromatic stimulant. The root has a pungent taste, causes a flow of saliva and a sensation of warmth in the mouth, and is said to afford relief from toothache. Some recent monographers have separated this and its related species from *Peucedanum*, grouping them in the genus *Imperatoria*.

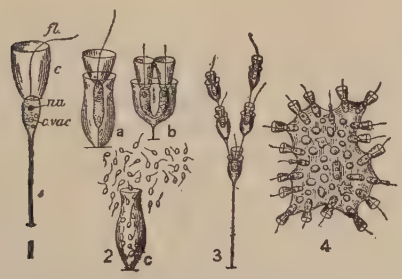
MAS'TIC (Fr. *mastic*, from Lat. *mastiche*, from Gk. *μαστίχη*, *mastichē*, mastic, from *μαστίζειν*, *mastizein*, to chew; so called because used as chewing gum in the East). A species of gum resin yielded by the mastic or lentisk tree (*Pistacia lentiscus*, *Pistacia atlantica*) and other species of the family Anacardiaceæ. It

oozes from cuts made in the bark and hardens on the stem in small, round, tearlike, straw-colored lumps, or, if not collected in time, it falls to the ground; in the latter state it acquires some impurities and is consequently less valuable. Its chief use is in making the almost colorless varnish for varnishing prints, maps, drawings, etc. It is also used by dentists for stopping hollow teeth and was formerly employed in medicine as a mild stimulant. Small quantities are exported chiefly from the Morocco coast, but some is occasionally shipped from the south of Europe. The name mastic is also given to oleaginous cements, composed of about seven parts of litharge and 93 of burned clay, reduced to fine powder, made into a paste with linseed oil. See SIDEROXYLON.

MAS'TIFF (OF. *mestif*, Fr. *métif*, of mixed breed, mongrel, from Lat. *mixtus*, p.p. of *miscere*, Gk. *μίσγειν*, *misgein*, *μιγνύναι*, *mignynai*, to mix, Skt. *miśra*, mixed, OChurch Slav. *mĕsiti*, Welsh *mysgu*, Gael. *measy*, OHG. *miskan*, Ger. *mischen*, AS. *miscian*, Eng. *mix*). A large dog of the hound group, kept since ancient times to guard property, and more recently as a pet. See HOUND.

MASTIFF BAT. One of a group of tropical American bats (genus *Molossus*), characterized by mastiff-like faces, general muscularity, and long, thick tails free from the membrane. They are better able than most other bats to scramble about on their feet. They assemble in large companies in hollow trees, caverns, and old houses, and sometimes constitute a nuisance by taking possession of roofs and garrets. One species (*Molossus periotis*) measures 2 feet across the outstretched wings. Consult P. H. Gosse, *A Naturalist's Sojourn in Jamaica* (London, 1851), and H. W. Bates, *The Naturalist on the River Amazons* (ib., 1910).

MAS'TIGOPH'ORA (Neo-Lat. nom. pl., from Gk. *μαστιγοφόρος*, *mastigophoros*, whip-bearing, from *μάστιξ*, *mastix*, whip + *φέρειν*, *pherein*, to bear). A class of Protozoa characterized by the presence of one or more flagella, or lashlike appendages. Some (*Euglena*) approach the plants and were formerly placed with them; others



CHOANOFLAGELLATA MASTIGOPHORA.

1, Monosiga; 2, Salpingoëca; 3, Polyeca; 4, Proterospongia; 2*b* illustrates longitudinal fission; 2*c*, the production of germs (flagellulæ); *c*, collar; *c.vac*, contractile vacuole; *fl*, flagellum; *l*, lorica; *nu*, nucleus. (After Kent.)

closely resemble Rhizopoda. The group is divided into four orders: (1) Flagellata (q.v.); (2) Choanoflagellata; (3) Dinoflagellata; (4) Cystoflagellata. See NOCTILUCA.

The Choanoflagellata, or collared monads, are mostly fixed and remarkable for their collar, a vaselike prolongation of the protoplasm of the body. In this respect they resemble the collared digestive cells lining the digestive sacs (ampullæ) of sponges. These forms are fixed or stalked, and tend to grow in colonies, so as to suggest the derivation of the sponges from some such forms. They have but a single flagellum, but no trace of a mouth or gullet. They multiply by longitudinal fission, or produce numerous young (flagellulæ).

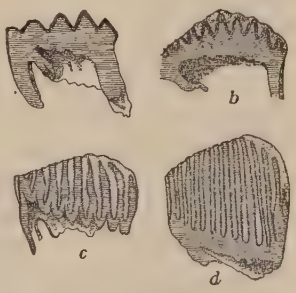
The third order, Dinoflagellata, move by means of two flagella, and are remarkable for having the body often protected by a very beautiful and elaborate shell formed of cellulose in plates, which is provided with three long processes or horns. They are mostly marine. Some are phosphorescent, while certain species occasionally abound in such enormous numbers as to color the sea water deep brown or red. See RED WATER.

Of the Cystoflagellata, which have two flagella, one is modified into a large long tentacle, the other minute and situated within the gullet. *Noctiluca* (q.v.) is the type.

MASTI'TIS. See MAMMARY GLAND, DISEASES OF; MAMMITIS.

MAS'TODON (Neo-Lat., from Gk. *μαστός*, *mastos*, breast + *ὀδούς*, *odous*, tooth). The name for a genus of extinct elephants. This genus is that most remote from the family type (*Elephas*) and nearest the *Dinotherium* type, by reason mainly of the structure of its molar teeth, which are provided with but few transverse ridges—not more than five—that have a ∧ form in cross section (occasionally broken into isolated conical tubercles) and are separated by little or no cement. (See MAMMOTH.) Another dental difference of the Tertiary mastodons from nearly all other Elephantidæ is its possession of milk molars, which in some instances persist through life, the permanent dentition in such cases being a mixture of milk and permanent teeth. Tusks (incisors) sometimes occur in both jaws.

Mastodons began to exist in the Miocene age and became extinct in the Pleistocene. They were scattered all over the globe, and more than 30 species have been distinguished by paleontologists, the latest described (1901) being a small and primitive type discovered in Egypt. This seems to confirm the prevailing opinion that the group originated in the Old World and spread to America by way of Siberia. Two or more species belong to South America (Patagonia), where no other elephant has thus far been found. It is probable that several species lived in North America, but the one best known and commonly in mind when the term is used is *Mastodon americanus*. This species seems to have ranged over all the United States and southern Canada and to have been numerous, for its teeth and bones, in a more or less perfect condition, are repeatedly found. A dozen or more mounted skeletons are on exhibition in



TEETH OF ELEPHANTS.

Comparison of tooth structure of proboscideans, shown by vertical cross sections of molars; *a*, mastodon; *b*, *Elephas insignis*, a fossil species intermediate between mastodons and true elephants; *c*, African elephant; *d*, mammoth. This series exhibits progress from simplicity to complexity.

museums in New York, Chicago, Pittsburgh, Cambridge, Mass., Albany, N. Y., and elsewhere. Careful comparison and study of these and other specimens show that this mastodon at least must have had the general form and appearance of a modern elephant, with a somewhat heavier body and flatter forehead than that of the mammoth or Indian elephant; nor did its height exceed theirs on the average—if anything it was less, owing chiefly to the shortness of the legs. The tusks, too, were of similar length (9 feet, measured along the outer curve, indicating an old and large male), and they had a characteristic tendency to curl upward, in much the same way as in living elephants. It is probable that the animal, at any rate in the more northerly parts of its range, was warmly clothed, like the mammoth, although there is not much direct evidence of it beyond the discovery, many years ago, of a large mass of woolly brown hair buried in a bog in Ulster Co., N. Y., in apparent connection with mastodon remains. Several of the most complete skeletons known have been obtained from that region, where animals had become mired in swampy valleys. The disappearance of this numerous and widespread species is as incomprehensible as in the case of the mammoth and the South American horse. That it existed until recent conditions were established is plain. The food remains in its stomach have been repeatedly analyzed and found to consist of herbage, bark, and leaves especially of conifers of the same kinds as now grow in the place where its bones lay. Workmen who came upon and broke mastodon bones in an Illinois peat bog (see *American Naturalist*, January, 1882) greased their boots with the marrow fat. It is the opinion of competent judges that remnants of the herds survived the advent of mankind into North America; there being many positive statements on record as to arrowheads lying among mastodon bones. On the whole, American geologists think it highly probable that the mastodon and man were briefly contemporary in North America and that it was the ancestors of the Indians who exterminated this unwieldy animal.

Consult: J. C. Warren, *The Mastodon Giganteus of North America* (Boston, 1855); F. A. Lucus, "Animals of the Past," in *American Museum of Natural History, Handbook Series No. 4* (New York, 1913); W. B. Scott, *A History of Land Mammals of the Western Hemisphere* (ib., 1913).

MAS'TODONSAU'RUS (Neo-Lat., from *mastodon*, mastodon + Gk. σαῦρος, *sauros*, lizard). The largest known labyrinthodont batrachian, found fossil in Triassic rocks of Württemberg, England, and India. The body attained a length of nearly 10 feet and the skull alone had a length of about 4 feet. See STEGOCEPHALIA.

MASTOIDI'TIS. See EAR.

MASUDI, mȧ-sōō'dē (Ar. ABU'L HASAN 'ALĪ AL MAS'ŪDĪ) (?–c.956). One of the most eminent Arabian geographers and historians. He was born in Bagdad, descended from a distinguished family, one of whose members, Mas'ud, was a companion of Mohammed on his flight to Medina. Masudi early devoted himself to profound studies; he also undertook extensive journeys into many lands even beyond the bounds of Islam. After traveling through Persia and Kirman he came in 916 to India, where he visited Multan and Mansura; thence he went to Ceylon and subsequently proceeded east as far as China. On his way back he spent some time in Madagascar and Oman. To the north he went to the Caspian district, and in 926 we find him at Tiberias in Palestine. In 943 he was at Antioch and two years later in Damascus. The rest of his life he spent in Syria and Egypt, dying at Fostat about 956. He was a geographer, philosopher, student of religions, familiar with Judaism and Christianity, and a historian acquainted with the ancient and mordern history of the East and West. His *Kitāb Akhbār al-Zamān* contained a universal history in 30 volumes; his *Kitāb al-Ausat*, a short chronological account of the world's history. Masudi combined these two in a more popular work called *Murūj al-Dhahab* (Meadows of Gold), in which he gives a general view of the political, religious, and social history of the most important Asiatic and European countries, as well as of their geography (ed. Bulak, 1866, Cairo, 1886; with French trans. by De Meynard and De Courteille, 9 vols., Paris, 1861–77; vol. i in English by A. Sprenger, London, 1841). A still more general work on history and geography was his *Kitāb al-Tanbīh* (ed. De Goeje, Leyden, 1894; partially trans. by De Sacy in *Notices et extraits*, vol. viii, and in vol. ix of the French trans. of the *Meadows*). Another work, also called *Akhbār al-Zamān*, is falsely ascribed to him. Consult: Carra de Vaux, *L'Abrège des merveilles* (Paris, 1898); Karl Brockelmann, *Geschichte der arabischen Litteratur*, vol. i (Weimar, 1899); R. A. Nicholson, *A Literary History of the Arabs* (Cambridge, 1907).

MASULIPATAM, mȧ-sōō'lē-pȧ-tăm'. The capital of the District of Kistna, Madras, British India, 215 miles north of the city of Madras, on the Bay of Bengal on one of the mouths of the Kistna (Map: India, D 6). Its former brisk export trade in cotton manufactures is in a state of decline and at present the city is of little industrial importance. There are still small industries in weaving, bleaching, and printing. Masulipatam was visited by a very severe storm in 1864, during which it is estimated that nearly 30,000 persons were killed. Its chief institution is Noble College. Pop., 1901, 39,507; 1911, 42,123.

MASURENLAND, mȧ-zōō'ren-länt. The name of the section of East Prussia which includes in the broadest sense the circles of Johannisburg, Sensburg, Lyck, Lötzen, Ortelsburg, Neidenburg, Rössel, Oletzka, Osterode, and Allenstein. The land is one of gently rolling topography, marked by hundreds of lakes, some of them basins with many branches, and some long narrow channels with several pieces of water following one another like beads on a string. The most important of these lakes, Mauer and Spirding, cover an area of more than 40 square miles. The whole region is connected by a canal system over 100 miles in length. Lyck is commonly called the capital of the entire district. Some years ago the German government thought of draining part of this region as Frederick the Great had done in the middle of the eighteenth century. The military authorities strongly objected, contending that this section would always be a barrier to a Russian invasion. The wisdom of following the latter course was well illustrated in the European War which began in 1914. On several occasions in the winter of 1914–15 the Russians made inroads into Masurenland. With the coming of spring and the melting of the ice they were compelled to retreat so as not to have their

lines of communication effectively cut. See WAR IN EUROPE.

MAT. See MATTING.

MA'T (Egypt. *Ma'et*, truth). An Egyptian deity, the goddess of truth and justice. She is usually represented as a woman wearing upon her head an ostrich feather, and occasionally her eyes are bandaged to indicate that she judges without respect to persons. She is always present at the judgment of the dead (q.v.), and it is her symbol, the feather, against which the heart of the deceased is weighed. At all periods the kings of Egypt professed themselves zealous worshipers of the goddess; judges especially were her priests and wore her image when on the bench. Ma't was the daughter of the sun god Rê; by the Greeks she was identified with Themis. Consult Alfred Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897), and A. E. T. W. Budge, *The Gods of the Egyptians*, vol. i (London, 1904). See Plate of EGYPTIAN DEITIES.

MATABELELAND, mät'ä-bē'lē-länd. One of the two divisions, or provinces, of Southern Rhodesia, lying east of the Bechuanaland Protectorate and separated from the Transvaal by the Limpopo River (Map: Africa, G 6). In 1888 the Matabele came within the British sphere of influence by a treaty signed by their chief, Lobengula. The following year they were brought under the administration of the British South Africa Company, against which they declared war in 1893. They were subdued after a spirited campaign, during which Lobengula died. In 1896–97 there was another revolt, after which the natives were allowed a share in the government, the country being divided into districts, each with a native commissioner, responsible for the good conduct of his people. The white population in 1911 numbered 10,975; native population, 249,108; in addition there were a number of Asiatics and other colored persons. The chief towns are Buluwayo, Gwelo, and Selukwe. Buluwayo had 5200 white inhabitants in 1911; it is on the main line of the "Cape to Cairo" Railway, 1362 miles from Cape Town, and is connected by rail with Salisbury, in Mashonaland, and with the Gwanda mines. See RHODESIA.

The Matabele, or Matabili, are a Zulu people of Bantu stock driven out of the Transvaal by the Boers into South Zambezia, thenceforth known as Matabeleland. The celebrated chief Umsilikatzi in 1838 led the exodus and after crossing the Limpopo established his seat of government at Buluwayo. His successor (1870) was the chief Lobengula. The Zulu military organization copied from Europeans enabled the Matabele, previous to British domination, to harass and almost destroy the surrounding Mashonas and other peoples and rendered much of the territory beyond the Limpopo a wilderness.

The Matabele are herdsmen and to their cattle they attach the highest importance, but they also raise great crops of maize, tobacco, and other agricultural products. Their houses are thatched, circular in plan, and have conical roofs. The villages have no particular arrangement. The women brew beer and grind maize as their principal duties. The men are brave hunters and are accustomed to attack the lion with their assegais. They smelt iron and work it into spears, battle-axes, hoes, etc. Rude pottery is made, and cloth from bark. They are polygamists. Ancestor worship is the most prominent feature of their religion. Consult: Frank Oates, *Matabele Land and the Victoria Falls* (London, 1881); Montague, *The Interior of Central Africa* (ib., 1886); Wills and Collingridge, *The Downfall of Lobengula* (ib., 1894); Norris *Matabeleland* (ib., 1895); R. S. S. Baden-Powell, *The Matabele Campaign* (2d ed., ib., 1901).

MATACHINES, mä'tä-chē'näs (from Sp. *matachin*, clown performer, masked dancer). A kind of dramatic dance given at Christmas time by the Spanish-speaking natives of New Mexico, that is usually said to relate to Montezuma, the last ruler of the Aztecs. The performers wear masks and headdresses and carry gourd rattles and three-tined wands, called "palms." The principal characters are El Monarca, "the monarch," i.e., Montezuma; La Malinche, a young and very pretty girl, who plays the leading female rôle (in reality the name Malinche is simply the Aztec pronunciation of Marina, the famous mistress of Cortés); El Toro, "the bull," a clown who wears a buffalo head and robe; and El Abuelo, "the grandfather," an old man who carries a whip and impersonates the Devil. The dance is partly processionial and partly stationary, with El Monarca either at the head of the procession or seated on a throne. La Malinche does a *pas seul* between the two lines of dancers, and according to one story succeeds by her gracefulness and beauty in relieving Montezuma from his melancholy and in making him return to his people, whom he had forsaken. Another explanation of the drama is that it represents an incident in the life of Cortés instead of Montezuma, and that La Malinche, Cortés's mistress, dances down between the lines of conspirators, learns their secret, and warns Cortés. There is undoubtedly an Indian element in the dance, and it belongs to a class of Indian-Spanish dramas, usually called *historias*, that are seen in many parts of Mexico and Central America.

MATACO, mä-tä'kō. A group of tribes constituting a distinct stock, ranging along the Vermejo River in the Chaco region of northern Argentina. They are pastoral hunters, subsisting entirely by hunting and fishing and the product of their horses and cattle. They fish with nets and arrows. They dress in skins and live in small brush huts, but are apt in the use of tools. They are rather under medium size, with hair frequently wavy. They are sometimes called Mataguayo, a name properly belonging to another tribe of Guaycuran stock living somewhat farther to the north. Consult: Lafone Quevedo, in *Instituto Geográfico Argentina, Boletin* (Buenos Aires, 1896–97); D. G. Brinton, *Linguistic Cartography of the Chaco Region* (Philadelphia, 1898); *Anales de la Sociedad Científica Argentina* (Buenos Aires, 1904); Schuller, *Sobre el orígen de los charruás* (Santiago, 1906).

MAT'ADOR, *Sp. pron.* mä'tä-dōr'. See BULLFIGHT.

MATAGALPA, mä'tä-gäl'pä. A town of Nicaragua, capital of the Department of Matagalpa (Map: Central America, E 4). It is situated on a plateau in the north-central part of the country and has a very pleasant climate. It is the centre of a rich agricultural district producing sugar, tobacco, and coffee. Stock raising, also, is carried on extensively. It is the seat of a United States consular agent. Pop. (est.), 15,749, largely native Indians.

MATAGUAYO, mä'tȧ-gwä'yô. An Indian stock of South America. See GUAIACURUAN; MATACO.

MATAJA, mȧ-tä'yȧ, VICTOR (1857–). An Austrian political economist, born in Vienna. He studied at the university of his native city, where he lectured from 1884 to 1890 on political economy. From 1890 to 1892 he was professor of law at the University of Innsbruck, and in the latter year he became councilor in the ministry and head of the Department of Statistics at Vienna. In 1897 he was appointed honorary professor of political economy in the University of Vienna. He published: *Der Unternehmergewinn* (1884); *Das Recht des Schadenersatzes vom Standpunkt der Nationalökonomie* (1888); *Grundriss des Gewerberechts und der Arbeiterversicherung* (1899); *Die Reklame* (1910).

MATAMATA, mä'tȧ-mä'tȧ (South American name). A large and singular turtle (*Chelys fimbriata*) of Guiana and northern Brazil, typical of the family Chelididæ. (See TURTLE.) In old age it is 35 to 40 inches long when the neck is outstretched; its rather flat shell is covered with large roughly conical shield plates in three fore-and-aft rows, with a margin of small rough plates. The plastron is weak and narrow. The neck is very long; the head is small and pointed, with the eyes small and close together; the ear flaps large; and the nose produced into a long soft tube at the end of which open minute nostrils. The jaws are very weak, and partly covered with smooth skin, so that prey (frogs, fishes, and the like) probably are sucked into the widely distensible throat rather than seized. The most remarkable thing about the creature, however, is the fact that its head and throat are covered with fringes of outgrowths of skin, in rows from its face to its shoulders. These float about like weeds as it lies quietly near the surface of the water, and conceal its true character so well that the small animals come within reach unsuspectingly. Not much is known of its life history or habits. See TURTLE.

MATAMOROS, mä'tȧ-mō'rôs. A town in the State of Tamaulipas, Mexico, on the south bank of the Rio Grande, 23 miles from its mouth and opposite Brownsville, Tex. (Map: Mexico, K 5). Its port is Bagdad (q.v.), and it is the seat of a United States consul, with which country it carries on a large trade. The chief exports are hides, skins, and cottonseed; the chief imports, manufactured goods from Great Britain and the United States. In 1913 its exports were valued at $2,388,173 and imports at $1,680,707. At the outbreak of the war between the United States and Mexico the Mexican forces were for some time concentrated here, but after the battle of Resaca de la Palma (q.v.) the city was evacuated and on May 18, 1846, the Americans under General Taylor took possession. Pop., about 10,000.

MATAMOROS, MARIANO (c.1770–1814). A Mexican patriot. Very little is known of his early life or education. He was a priest at a small village called Jantelolco, near Cuernavaca, when in 1811, aroused by the constant insults and atrocities of the Spanish troops, he joined the army of insurgents under command of the patriot Morelos. By him he was raised to the rank of colonel. He took a most important part in the siege of Cuautla (1812) and the capture of Oajaca (1812), and most notably at the victory of San Augustin del Palmar (1813), which was due almost entirely to his military genius. He took part in the unsuccessful attack on Valladolid (Dec. 22, 1813) and was captured in the defeat suffered by the revolutionists at Puruarán (Jan. 5, 1814). He was court-martialed and shot in the Plaza of Valladolid on Feb. 3, 1814. He was an active and successful leader of the revolution and performed valuable service in organizing the troops and maintaining military discipline. His death was a severe blow to the patriot cause at a very critical moment when it was suffering many reverses. His name has been bestowed on the important town of Matamoros, on the Rio Grande, and upon many smaller towns and districts of the country. By the historians of the time he is considered one of the most skillful of the revolutionary leaders.

MATANE, mȧ'tȧn'. A town of Rimouski Co., Quebec, Canada, situated on the Intercolonial and Canada and Gulf Terminal railways (Map: Quebec, A 2). There is steamship communication with Montreal and Gaspé. It is the seat of an extensive lumber industry and has large saw mills. Pop., 1901, 1176; 1911, 2056.

MATANUS'KA RIVER. A stream tributary to Knik Arm, Cook Inlet, Alaska (Map: Alaska, J 5). The Matanuska valley sprang into importance through the legislation of the 62d and 63d Congresses for the construction of railways and for the development of the coal resources of Alaska. The Matanuska coal fields are distant 25 miles from Knik Arm, which is frozen over in winter. The coal varies from subbituminous and semibituminous up to anthracite in quality. Areas aggregating about 47 square miles are underlain by coal, in seams varying from 5 to 36 feet in thickness. Under the Act of Congress of Oct. 20, 1914, the entire area is to be surveyed and 7680 acres of the best coal seams are to be reserved for the exclusive use of the United States. The remaining areas are to be leased, under competition and by the royalty system, for development by American citizens. The Railway Commission of 1913 recommended that a branch line of railway be constructed connecting the Matanuska coal fields with tidewater for the economical transportation of the coal mined. Such line is to be built from the appropriation of $35,000,000 made by Congress for the construction of government railways in Alaska. Consult Martin, "Matanuska Coal Field," in *United States Geological Survey, Bulletin 239*, and "Railway Routes in Alaska," *62d Congress, 3d Session, House of Representatives, Document 1346*. See ALASKA, *Geology, Mining*.

MATAN'ZAS. A province of Cuba, occupying the west-central part of the island and bounded on the north by Florida Strait, on the east and south by the Province of Santa Clara, and on the west by a short coast line on the Ensenada de la Broa and the Province of La Habana (Map: Cuba, D 4). Its area is 3700 square miles. A line of highlands reaching a height of 1300 feet runs along the north coast, but the province as a whole is low, merging towards the south into the large swamps of Zapata. The chief industry is the production of sugar cane and the manufacture of sugar. Oranges, bananas, henequen, sweet potatoes, and corn are extensively grown. The development of the resources of the province has been facilitated by its network of railways. Its extensive

commerce is carried on mainly in Matanzas (q.v.), the capital, and Cárdenas, which rank second and fifth respectively in commercial importance in the island. Pop., 1899, 202,214; 1907, 239,812; 1913 (est.), 266,376.

MATANZAS. The capital of the Province of Matanzas, Cuba, and the third city in population of the Republic (Map: Cuba, D 3). It is situated in an amphitheatre-like location at the head of the Bay of Matanzas on the north coast of Cuba, 44 miles east of Havana. The small rivers Yumuri and San Juan divide the city into three parts: to the north Versalles, a residence district; in the centre Matanzas proper, the commercial and most thickly populated section; and to the south Pueblo Nuevo, the industrial and railway centre. Its streets are straight and regular, and it has a handsome square, the Plaza de la Libertad. In Versalles is the fine drive, Paseo de Martí, with a monument to the memory of the martyrs of independence, beyond which is the old Fort San Severino, a seventeenth-century structure. The principal buildings are the San Esteban theatre, the market, the government building, several churches, the lyceum, and the Spanish casino. The city has a tropical but healthful climate, and although it still has a defective sewage system, sanitary conditions have been considerably improved since the first American intervention. The harbor is large and well sheltered, but owing to lack of improvements vessels are forced to anchor some distance from shore and load and unload by lighters. Matanzas is second only to Havana as a Cuban commercial and railway centre. Its exports are chiefly sugar, molasses, and rum, and its imports, manufactured articles. Industries include a petroleum refinery, which supplies the whole island, sugar refineries, rum distilleries, tanneries, shoe factories, car and machine shops, and guava-jelly factories. Cordage is also manufactured from henequen, grown near the city. The city is the seat of a United States consular agent. Pop., 1907, urban, 39,005; municipal, 64,385. Matanzas was founded in 1693. Its harbor was long the refuge of pirates. The home of the poets Heredia, Milanes, and Plácido, it was once known as the Athens of Cuba. The city is surrounded on the land side by rocky hills, upon the summit of which, to the north, is located the Monserrat Chapel, built in 1875 by a Catalan society and having the retablo of the altar uniquely made of cork brought from Spain. From here one has a view of the Yumuri valley, said to be one of the most beautiful in the world. Three miles east of the city are the caves of Bellamar, with their wonderful variety of stalagmite and stalactite formations.

MAT'APAN', Cape. See Cape Matapan.

MATARÓ, mä-tä-rō'. A town of northeast Spain, in the Province of Barcelona, situated on the Mediterranean coast 18 miles northeast of Barcelona (Map: Spain, G 2). It is surrounded by vineyards and gardens and has several handsome promenades, a seminary, a school of arts, and the celebrated Colegio de Valldemia. It is an important industrial centre and manufactures cotton and woolen textiles, sailcloth, starch, soap, glass, chemicals, and pigments, especially white lead. There is also some shipbuilding, but the commerce is insignificant. The railroad between Mataró and Barcelona was the earliest road built in Spain. Pop., 1900, 18,765; 1910, 19,918.

MATAS, mät'ăs, Rudolph (1860–). An American surgeon, born near New Orleans. He was educated at Barcelona, Spain, at Paris, France, at Brownsville, Tex., and Soule's College, New Orleans, and graduated from the Literary Institute of St. John at Matamoros, Mexico, in 1876, and from Tulane University (M.D.) in 1880. Thereafter he practiced in New Orleans, where he became known as a specialist in surgery after 1895. In the latter year also he was appointed professor of surgery at Tulane. He became senior surgeon of Touro Infirmary, senior visiting surgeon of the Charity Hospital, and first lieutenant in the United States Medical Reserve Corps. He edited the New Orleans *Medical and Surgical Journal* in 1883–95, was elected president of the American Surgical Association in 1909, and served also as president of the Louisiana State Medical Society in 1894–95 and of the Southern Surgical and Gynecological Association in 1911.

MATCHES (OF. *mesche*, Fr. *mèche*, It. *miccia*, match, from ML. *mixa*, Lat. *myxus*, wick, from Gk. *μύξα*, *myxa*, lamp nozzle). Specially prepared pieces of inflammable material designed to enable the user to obtain fire readily. At present the name match, or friction match, is usually applied to a splinter of wood, tipped with some combustible material which will ignite on being rubbed against either a specially prepared or any rough surface. One of the first forms of this useful article was the brimstone match, made by cutting dry pine wood into thin strips about 6 inches long, pointing the ends, and dipping the latter into melted sulphur; thus prepared, the sulphur points instantly ignited when applied to a spark obtained by striking fire into tinder from a flint and steel. Early in the nineteenth century was invented the instantaneous light box, which consisted of a small tin box containing a bottle in which was placed some sulphuric acid, with sufficient fibrous asbestos to soak it up, and a supply of properly prepared matches. The latter were splints of wood which had been dipped first into melted sulphur and afterward into a paste composed of chlorate of potash, powdered loaf sugar, powdered gum arabic, and a little vermilion as coloring matter. By dipping these prepared points into the sulphuric acid the matches were instantly ignited. The chief disadvantages of this device were the danger of using a material so destructive as sulphuric acid, together with its great power of absorbing moisture, which soon rendered it inert.

In 1827 the first true friction match was invented by John Walker, of Stockton-on-Tees, Durham. The inflammable mixture was a compound of chlorate of potash and sulphuret of antimony with enough of powdered gum to render it adhesive when mixed with water and applied to the end of the match, which had previously been dipped in melted brimstone. These matches were ignited by the friction caused by drawing them through a piece of bent sandpaper. Imitations of Walker's matches, known as lucifers, were made by Samuel Jones from 1829 to 1830 and G. F. Watts, and Richard Bell & Co., competitors, also put out lucifers, borrowing the name.

The ignition of sulphur and phosphorus by friction was discovered by Godfrey Haukwitz in 1680, and it was 150 years before this discovery was applied to matches. It is stated that in 1833 phosphorus friction matches were made at

Vienna. About the same time Walker, who invented the original friction match, substituted phosphorus for the former mixture. In 1836 the first improved friction matches were made in the United States by Alonzo Phillips, of Springfield, Mass. The body of these matches is usually of wood, but some, called vestas, are of very thin wax-taper strips and were first patented in 1832 and manufactured a few years later, and latterly cardboard has been employed. The composition of the head of an ordinary match consists of phosphorus and nitre, or phosphorus, sulphur, and chlorate of potash, mixed with melted gum or glue, and colored with vermilion, umber, soot, or other coloring material.

In later processes lead peroxide, red lead, or manganese dioxide were substituted for the nitre. The precise formulas are generally preserved as trade secrets. The simplest and cheapest matches for many years were phosphorus sulphur matches, which lighted easily and were made of white phosphorus, being sold in the splint, card, or block type. These were succeeded in large part by the so-called parlor match with a more inflammable head, where the sulphur was replaced by other chemicals.

To obviate the danger of fire incurred by using matches so readily ignitable as the ordinary or parlor match, safety or strike-on-box matches were put upon the market in 1855 and since have been extensively used. Their inventor was a Swede named Lundstrom. The safety match differs from the ordinary match in having the phosphorus omitted from the composition applied to the match stick and combined instead with sand to form a friction surface on the match box, where the matches, which usually have chlorate of potash in their heads, are rubbed in order to be lighted. The dipping composition varies in different brands, most of which are made in European countries rather than in America, where the output is relatively small, though the quality good. In the United States double-top or double-dip matches have in large measure supplanted the parlor or single-dip type. They contain a large flame-producing head of highly inflammable material containing no phosphorus and a cap that may or may not contain phosphorus. Such matches strike anywhere and easily and were first proposed in 1898 and again in 1899. They were put upon the American market in 1905.

The constant handling of ordinary white or yellow phosphorus is a very unhealthful occupation, the emanation of phosphorus oxides giving rise to necrosis, or mortification of the bones of the jaw, producing the so-called "phossy jaw" disease once common in the match industry. In the early days of match manufacture the industry was largely carried on, in European countries, in cellars, and deaths from necrosis were so common that government intervention was necessary to drive the manufacturers into more sanitary quarters. In the modern match factory better surroundings, the increased use of mechanical appliances, and the smaller amount of phosphorus used have greatly decreased the danger incurred by matchmakers. It can, however, be entirely removed if the more expensive red or amorphous phosphorus, or the sesquisulphide of phosphorus, be used in its stead.

To-day the use of white phosphorus is in large measure prohibited or placed under restriction. The first step was taken in 1875 when Denmark forbade its use, and this was followed by Switzerland in 1879. In 1906 an international conference was held at Berne and a treaty proposed, which was followed by laws prohibiting the sale or importation of matches made of the white or yellow phosphorus in Switzerland, Luxemburg, Germany, France, Netherlands, Austria, and Spain. In 1908 the White Phosphorus Matches Prohibition Act was passed in Great Britain, and since 1910 it has been illegal to import or sell matches containing white phosphorus. The evil effects of white phosphorus were realized also in the United States, and it was proposed in 1910 to deal with the matter by a heavy internal revenue tax on all matches made from white phosphorus. In fact, this was recommended by President Taft in a message to Congress. On Jan. 27, 1911, the Diamond Match Company, the largest manufacturers in the United States and the sole owners of patents for the use of tetraphosphorus trisulphide in America, surrendered these patents for cancellation so that the process could be used by any one and thus avoid the dangers of white phosphorus. The Esch-Hughes Nonpoisonous Match Act, which made white phosphorus matches impossible through heavy taxation, became effective July 1, 1913, and practically rendered obsolete the old white phosphorus matches made in the United States. In their place there was employed practically universally for the prime igniting ingredient a nonpoisonous sesquisulphide of phosphorus compound which required for its ignition a temperature of about 210° F. as compared with white phosphorus which ignites at an ordinary room temperature. The white phosphorus matches would ignite at a temperature of 150°–200° F., while the sesquisulphide of phosphorus variety would ignite at 300°–350° F. The bill for safer matches received the approval also of the fire-prevention interests, as matches were a prolific source of fires. The old-fashioned matches were often ignited by rats and other rodents, who will not eat the sesqui matches.

In the better grades of matches, to prevent the smoldering of the burnt stems, the sticks or splints are usually soaked or impregnated in a solution of magnesium sulphate, alum, or sodium phosphate before the head is formed by dipping; this is done for both safety and strike-anywhere matches.

In the United States, as in most European countries, the sale of matches is regarded in much the same light as that of explosives and combustibles, and is regulated by State laws or municipal and insurance fire regulations which prescribe in detail the number of and conditions under which matches may be stored. In some States and cities the kind of match is also restricted, and only those considered reasonably safe are specified in the regulations, while the Underwriters' Laboratories will approve certain types and brands of matches which meet their conditions. Model match laws are now found in several States and in the ordinances of a number of cities.

In Great Britain, Norway, Sweden, Germany, Austria, China, and Japan the matchmaking industry has assumed enormous proportions. In France the making of matches is a government monopoly. In the United States the match industry is highly competitive; the Diamond Match Company making about 60 per cent of the matches consumed in the country, estimated at 250,000,000,000 a year. There are about a

dozen manufacturing companies in America, and the Diamond Match Company operates four factories. Much ingenious and automatic machinery is used in its factories. The first step in the manufacture of larger ordinary and safety matches is to prepare the splints from blocks of pine from which all knots and cross-grained portions have been removed. This wood comes in the form of planks 2 inches thick and is thoroughly dried. It is then sawed into lengths of from 1⅞ to 2½ inches, or the length of an ordinary match. A machine now receives these blocks, and they are cut by knives or dies into rows of splints, each row containing splints for 44 matches. Each row of splints as it is cut from the block is placed in cast-iron plates which are formed into an endless chain. The machine makes from 175 to 250 revolutions a minute, and, as has been said, at each revolution 44 matches are cut and set. Another important type of machine for the smaller matches makes the splints or sticks by cutting off veneers by a log-peeling machine. These are then cut into rectangular match sticks and are "cleaned" and straightened. After the splints have been cut and set in the plates they are carried over a drying or heating block, where they are heated in order that the melted paraffin may not become cold on the exterior of the stick, but may saturate the end thoroughly. The paraffin and the composition which forms the head of the match are placed in proper receptacles, which are automatically replenished without stopping the machine. Through these the splints pass, and at the composition rollers the head of the match is received. As the chain carries the bundles along the matches are cooled and dried by blasts of air, and finally they are automatically removed and packed in appropriate boxes. One such machine will yield 100 gross of boxes per day and requires the attention of eight girls. The boxes, which have been made by automatic machinery too, are fed into the machine automatically, and after receiving their contents are discharged on a rotating table, where they receive their covers at the hands of girls, two to four being employed at each table. After the chain has discharged its matches into boxes it is ready for a fresh set of splints, and the operation proceeds continuously.

The use of automatic machinery is also applied to the manufacture of so-called book matches, where strips of cardboard, separated so as to form individual matches, are bound in cardboard cases with a striking surface. An automatic machine prints the cardboard, cuts it into combs, dips the ends in the igniting mixture, folds it, stitches it into books, and affixes to the outside the patent striking composition. These book matches, which have found wide vogue, especially for advertising purposes and for pocket match safes, date from about 1899.

In England and parts of continental Europe match boxes once were made by hand by laborers as a household industry, but latterly in many countries, as in America, the making of boxes is effected by automatic machinery and is a part of the matchmaking establishment.

The following figures show the value of matches exported from and imported into the United States for selected years:

YEAR	Imported	Exported
1900	$156,705	$95,422
1905	187,951	52,834
1910	372,945	80,877
1911	588,309	77,106
1912	510,146	92,851
1913	730,170	102,407
1914	882,795	77,736

The following estimate of the match production of the world for 1910 affords a comparative idea of the industry:

COUNTRY	Gross of boxes per annum
United Kingdom	17,250,000
Sweden and Norway	24,290,000
Germany and Austria	14,000,000
France	4,800,000
America	21,800,000

The development of the match industry in the United States is shown by the accompanying table from the thirteenth United States census, which includes the statistics of the various establishments that manufacture friction, parlor, and safety matches. These statistics cover the various censuses of 1849 to 1909 inclusive:

YEARS	Number of establishments	Wage earners (average number)	Wages	Cost of materials	Value of products	Value added by manufacture
1909	26	3,631	$1,389,719	$4,598,878	$11,353,138	$6,754,260
1904	23	3,185	1,100,890	3,284,855	5,646,741	2,361,886
1899	22	2,047	612,715	3,420,740	6,005,937	2,585,197
1889	27	1,696	473,556	935,008	2,193,638	1,258,630
1879	37	2,219	535,911	3,298,562	4,668,496	1,369,934
1869	75	2,556	616,714	1,179,666	3,540,008	2,360,342
1859	75	1,252	179,450	229,720	698,566	468,846
1849	60	1,021	154,620	137,514	427,823	290,309

MATE (ODutch *maet*, Dutch *maat*, Ger. *Maat*, companion). In the merchant service mates are the officers of a ship subordinate to the master. Large vessels have a first, second, third, and sometimes a fourth mate; smaller ships have one or two less. In steamers they are now very commonly called first officer, second officer, etc. (instead of first mate, second mate). The first or chief mate performs the duties of executive for the master. In port he superintends and directs the stowage and discharge of cargo and has general care of the ship. At sea he assists the master in navigating and keeps the log; in most ships he has command of the port watch. His qualifications are superior to those required of the other mates, and he is usually, like the master, appointed by the owners and may be discharged by them only, except in unusual circumstances. In case of the death or disability of the master he succeeds to the command. The second mate commands the starboard watch at sea. He is not usually required to have a thorough knowledge of navigation, but should be a thorough seaman capable of directing the men in any kind of seamen's work. The

third and fourth mates (when there are such) have duties similar to those of a second mate. Very large steamers, such as the great transatlantic liners, have more than four mates or officers of this status. A mate in the United States navy is technically a petty officer, but is classed with warrant officers, though junior to them and holding only an appointment instead of a warrant. The uniform is similar to that of warrant officers. Mates were formerly called master's mates and a large number of them were in service during the Civil War. Boatswain's mates, gunner's mates, carpenter's mates, machinist's mates, etc., are petty officers and wear the appropriate petty officer's uniform. See PETTY OFFICER.

MATÉ, mä'tâ, or PARAGUAY TEA (abbreviation of Spanish *yerba de maté*, calabash herb). A substitute for tea, extensively used in South America, and almost universally through Brazil. It consists of the leaves and green shoots of certain species of holly (q.v.), more especially *Ilex paraguayensis*, dried and roughly ground. The true maté is a large shrub or small tree with smooth leaves and axillary umbels of small flowers. The leaves of a number of other species of *Ilex* are mixed with maté, and sometimes it is adulterated with leaves of plants in no way related to it. The term "maté," which has by usage become attached to this material, belongs originally to the vessels in which it was infused for drinking; these were usually made of gourds or calabashes, often trained into curious forms during their growth. Into the hollow vessels thus formed a small quantity of the material is put, and boiling water is added. The original method of drinking was as follows: each person who was to partake of the beverage was provided with a small tube about 8 inches long with a bulblike strainer at one end made either of fine basketwork or of perforated metal to prevent the fine particles from being drawn up into the mouth, and when his turn came he dipped in his tube (bombilla), sucked up a small portion of the infusion, and passed the maté bowl on to the next person. It is extremely unpleasant to Europeans at the high temperature at which it is usually drunk. The effect of maté is much the same as that of tea, stimulating and restorative, owing to the presence of a large proportion of caffein. The collection and preparation of maté is a large industrial occupation in Paraguay and Brazil, upward of 5,000,000 pounds of maté being annually exported from Paraguay to other parts of South America, but it is not yet an important article of export to other quarters of the world. See Plate of BEVERAGE PLANTS.

MATEHUALA, mä'tâ-wä'lâ. A town in the southern part of the State of Nuevo León, Mexico (Map: Mexico, J 6). It has wide and straight streets and several plazas, one containing a garden and a statue of Neptune. There are silver, gold, and copper mines in the neighborhood, and the town has several silver-smelting establishments. Pop., 12,000.

MATEJKO, mâ-tā'kô, JAN ALOYSIUS (1838–93). A Polish painter, born at Cracow. He studied at the art school in his native town, then went to Munich, and afterward studied at the Vienna Academy. In 1873 he was appointed director of the Cracow Art School. He was awarded a first-class medal at the Paris Exposition of 1867 and a medal of honor in 1878. His principal works are large paintings of incidents in Polish history and include an "Episode from the Diet at Warsaw" (1867, Vienna Museum); "The Union of Lublin, 1569" (1875); "Wernyhora Prophesying the Future of Poland"; "Albrecht von Brandenburg Doing Homage to King Sigismund I" (1882, National Museum, Cracow); "John Sobieski Raising the Siege of Vienna" (Vatican, Rome); "Declaration of the Polish Constitution" (1892). They are spirited in conception and notable for the archæological knowledge displayed in their detail, but are usually glaring in color and confused in composition. He also painted excellent portraits and published *Ubióry w Polsce* (1860), a work representing the costumes of the Polish nation from 1222 to 1795. Many of the best present-day Polish painters were pupils of Matejko.

MATERA, mâ-tā'râ. A city of the Province of Potenza, Italy, 34 miles west-northwest of Taranto (Map: Italy, F 4). It is irregularly built on steep slopes, 1300 feet above the sea. The roofs of the houses of the lower streets are on a level with the roadbeds of the upper streets. The principal buildings are an episcopal palace, a cathedral, and a college. Matera has manufactures of leather and arms and a trade in oil and agricultural produce. In the vicinity are the famous troglodyte caverns of Monte Scaglioso, still used as dwelling places by some of the lower classes. Matera is the seat of an archbishop. Pop. (commune), 1901, 17,237; 1911, 17,324.

MATE'RIALISM (from *material*, from Lat. *materialis*, relating to matter, from *materia*, matter). Usually defined as the philosophical view which resolves all existence into matter or into an attribute or merely an effect of matter. It makes matter the central ultimate reality and makes everything else, consciousness included, a derivative appearance, which is then sometimes treated as illusory. When consciousness is treated as illusory, materialism is suicidal, for the simple reason that materialism can have meaning only for a conscious being, and if consciousness is treated as a vain show, materialism can consistently be regarded only as one of the varieties in the show. But such an attitude towards consciousness is not to be consistently maintained (see KNOWLEDGE, THEORY OF); hence the only forms of materialism we need here consider are those that regard consciousness as an effect or as an attribute of matter, which, following Külpe, we shall call the causal and the attributive forms of materialism.

The attributive form assumes that substance is what the etymology of the word would suggest—viz., a permanent unchanging entity which furnishes the support for various appearances; these appearances, as referable to the substance, are called its attributes. Materialism of this type regards this substance as an extended, impenetrable, movable entity, which in some way has inhering in it or resting upon it or referable to it the attribute of consciousness, which may be treated as either a separable or an inseparable mark. This method of dealing with the relation of matter and consciousness is charmingly simple, but it is the simplicity of uncritical thought. It must be discarded along with the notion of substance (q.v.) interpreted as substratum. Substance is, properly speaking, nothing but the unitary complex of qualities called attributes. Instead of being simple, substance has a complexity measurable only by the number of attributes it possesses. Not that it is a mere com-

pound; it is unitary in the sense that all the attributes organize themselves simultaneously or successively into a single differentiable object. Now, if any substance has consciousness as an attribute, that substance is by that token a conscious substance, and to call it merely material is to be blind to the fact that materiality is as much an attribute as color or duration. If matter is always or sometimes conscious, it is not matter as ordinarily conceived. To call this conscious thing matter is not to take a philosophical attitude but to set up as a lexicographical reformer.

Causal materialism is true or false according to the interpretation put upon cause; but even when that interpretation is true, materialism is only a half truth, for in that case matter is as dependent on mind as mind is on matter. If by cause is meant anything but the invariable condition of an event, causal materialism is questionable, for there is no reason to suppose there is any such cause. (See CAUSALITY.) But if by cause is meant an invariable condition, then all experience warrants us in saying that a certain organization of matter is cause of consciousness. Such a statement, however, says nothing about the nature of consciousness except that it requires, as a condition of its appearance at a certain time, that there should be in existence at that time some sort of nervous organization. If one proceeds to say that the physical world is not in its turn dependent on the psychical, that statement must be challenged. If the statement merely means that some form of physical existence preceded in time any ascertainable form of consciousness, no valid objection can be raised; but if it means that the physical can be conceived to exist out of all relation to the psychical, then the assertion is questionable. For every judgment is passed upon reality as it appears to the judging consciousness. Reality apart from a judging consciousness is *eo ipso* unknowable. But this impossibility of the knowledge apart from consciousness is not the impossibility of an existence antedating consciousness. Relation to consciousness there must be in any conceivable reality; but the relation need not be one of simultaneity. It is indubitable that we can know things which do not exist at the time we know them. But if there can be knowledge of things which antedate the knower, there is nothing impossible in the supposition that knowable, if not known, objects were themselves the causes of the succeeding knowledge. But if they were causes of the succeeding knowledge, then the succeeding knowledge is an integral element in the system of which the cause is likewise a determining element. In other words, effect and cause are reciprocal and both are indispensable in the causal system. It is only when the time order is taken in the historical sense that cause is considered more important than the effect. This is not to say that the effect is the cause of its cause, for cause means indispensable *antecedent*, and that is what the effect, as effect, is not. But it is indispensable nevertheless. For instance, if the universe is of such a nature that the interposition of an opaque body between a luminous body and an eye means an eclipse of the luminous body, the absence of such an eclipse carries with it the absence of such an interposition. This same principle would make consciousness, which is the result of physical conditions, itself an indispensable element in the universe in which its causes existed. One cannot admit the existence of the physical cause of a psychic effect without admitting the existence of the psychic effect. In other words, we cannot conceive consciousness absolutely absent from the universe; we cannot think away consciousness from its place in the universe without thinking away this very thinking, i.e., without doing the impossible. We may ignore our own consciousness and that of others in our philosophical system, but if we do, so much the worse for our system. What a system of reality could be that had no place in it for a knowing mind, no knowing mind in that system could say. This point is forcibly presented by Prof. H. S. Jennings from the biological side. "*Every diversity in conscious states is accompanied by a diversity in physical conditions* . . . it follows also that *every diversity of conscious states* (plus the concomitant physical conditions) *is preceded by a diversity in physical conditions.* Such being the case, the question whether the same antecedent physical conditions without consciousness would produce the same or a different result contains contradictory specifications and is without experimental meaning. For without consciousness, and indeed the particular given kind of consciousness, the physical conditions are not the same. No experimental meaning can be given to the question whether it is the antecedent physical diversity or the antecedent conscious diversity that is efficacious in producing the diversity of results, for the two are inseparable.

Now the materialist who makes consciousness an effect of matter, but not itself an indispensable element in the universe, fails to see this logical interrelation of effect and cause. A materialist who recognizes this interdependence ceases thereby to be a materialist, for now in his theory his reasons must be acknowledged to be as much characterized by mental facts when and whence those facts are, as it is characterized by physical facts when and where these latter facts are. Neither is independent, although one may be prior. The materialist looks at the priority and overlooks the interdependence. One consequence of overlooking this interdependence is the assumption that the laws of matter are the only natural laws. Consciousness is regarded as running its course in accordance with mechanical principles. Hence will is of no determining value. It is this corollary from materialism that has made the doctrine so distasteful to the ordinary thinker. For this corollary means the denial of moral responsibility. But the results of the renewed study of psychology within recent years have made it quite impossible to assert that the laws of consciousness are mechanical laws as these laws manifest themselves in the purely material part of the universe. See MECHANISM.

Materialism is an old view; all the Ionic philosophers (see IONIAN SCHOOL) were by implication materialists; Democritus, Leucippus, Epicurus, and Lucretius (see articles on them) worked out a quite elaborate materialistic system. There is a materialistic vein running through the thought of many of the Italian philosophers of the Renaissance. Gassendi, likewise, makes consciousness, at least in the form of feeling, an inseparable attribute of matter. The eighteenth century was especially marked by its materialistic philosophy. Priestley in England and La Mattrie, Diderot, and Holbach

in France were outspoken in their materialism of the attributive kind. The latter part of the eighteenth century and the early part of the nineteenth century were characterized by a strong antimaterialistic reaction, to be followed again in the middle of the latter century by a strong outburst of materialistic thought. Carl Vogt, Jacob Moleschoot, Louis Büchner, and Heinrich Czolbe carried on a vigorous propagandism in favor of materialism, but the results of the scientific study of psychology were too patent, and the nineteenth century went out with a strong dislike for the view that made matter the one essential reality. Many systems of thought of the present day are styled materialistic by their opponents, but are really not materialistic at all, inasmuch as they recognize the indefeasibility of consciousness.

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MATERIALS, Strength of. See Strength of Materials.

MATE'RIA MED'ICA (Lat., medical material). That department of the science of medicine which treats of the materials employed for the alleviation and cure of disease: (1) their physical properties; (2) various modes of preparation; (3) chemical composition and relations, including the tests for purity and the means of detecting probable adulterations; (4) physiological action on man and animals in large and small doses; (5) therapeutic actions and uses, and the average doses in which they should be prescribed; and (6) the official preparations containing the substances in question, and their uses. Strict classification of drugs into groups according to their physiological action is impossible, as their action is so complex that one would often be found in several classes. It is, however, customary to group them according to their most marked or important characteristic for convenience of description and ease in recalling those having a common action. See Therapeutics; Pharmacopœia.

MATÉRIEL, má'tâ'rē'ĕl' (Lat. *materialis*, relating to matter). The term in its military sense is applied to the completed units of military and naval armament, stores, transportation, and equipment, as distinguished from the *materials* of which such units are constructed. A gun is part of the *matériel* of artillery; the *material* in the gun is principally steel.

MATERNA, mâ-tĕr'nâ, Amalie (1847–1918). An Austrian opera singer, born in St. Georgen, Styria. She made her first stage appearance in Graz, 1864, and in the same year married Karl Friedrich, a well-known actor, and with him was engaged at the Carl-Theater, Vienna. Her début as a prima donna occurred in 1869, when she sang at the Imperial Opera as Selika in *L'Africaine*. In 1876 she created the part of Brunhilda at Bayreuth. She became one of the greatest sopranos of the early Wagnerian opera, and a great favorite in the United States. She retired in 1897.

MAT GRASS. See Ammophila; Nardus.

MATHEMAT'ICAL SOCIETY, The American. A national association for the advancement of mathematical science. It was reorganized under its present name in July, 1894, and has a membership of about 700. Its library of some 5000 volumes is deposited in the library of Columbia University. Meetings are held three times a year in New York City and twice a year at Chicago. There is also a general summer meeting, and sectional meetings are held in California and in the central West. The society publishes two journals, the *Bulletin* and the *Transactions*, and has issued several volumes of *Colloquium Lectures*. The list of ex-presidents includes Emory McClintock, G. W. Hill, Simon Newcomb, R. S. Woodward, E. H. Moore, T. S. Fiske, W. F. Osgood, H. S. White, Maxime Bôcher, H. B. Fine, E. B. Van Vleck, and E. W. Brown.

MATHEMATICAL SOCIETY, The London. An association founded in 1865 by a number of English mathematicians and incorporated in 1894. It was instituted for the promotion of mathematical knowledge. The society owns an excellent library of books and periodicals on scientific subjects. The society began in 1865 the publication of the *Proceedings of the London Mathematical Society*, and has now over 35 volumes of essays upon advanced mathematical topics. During the session 1913–14 over 40 papers were read on mathematical subjects and 20 of these were published. The meetings are held on the second Thursday in each month, from November to June, and the anniversary meeting is in November. The president in 1914 was Professor A. E. H. Love, F.R.S., and the honorary secretary, J. H. Grace, F.R.S.

MATHEMAT'ICS (Lat. *mathematica*, from Gk. *μαθηματική, mathēmatikē*, mathematics, from *μάθημα, mathēma*, learning, science, from *μανθάνειν, manthanein*, to learn). The technical meaning of the word is due to the Pythagoreans, who distinguished four branches: "There are four degrees of mathematics: arithmetic, music, geometry, spherics." In modern times attempts have frequently been made to frame a satisfactory definition of the scope of the science. Descartes asserts that "all sciences which have for their object the search after order and measure belong to mathematics." D'Alembert in the *Encyclopédie* defines it as the science which considers the properties of magnitude in so far as this is calculable or measurable. Comte, in his *Philosophie positive*, speaks of it as the science which proposes to determine certain magnitudes from certain others from the exact relations that exist between them. Sagnet has proposed the following: "Mathematics have for their object the study of exact and necessary relations concerning the magnitude, the form, and the relative position of various objects, material or immaterial, which appeal to our senses." With regard to these definitions it may be observed that

they are all based on concepts such as "magnitude," "order," "measure," which are themselves extremely difficult to define.

History. Mathematics as a science makes its first definite appearance among the Egyptians. There are evidences of its antiquity among the Chinese, Hindus, and Babylonians, but the earliest written records of considerable mathematical progress are found in Egypt, and give an interesting view of the state of the science as early as the latter part of the third millennium before Christ. At that time arithmetic was sufficiently developed to include a fair numerical system, a cumbersome but elaborate treatment of common fractions, and some work in finite series. A limited and imperfect system of mensuration was known, a beginning was made in algebraic symbolism, and the simple equation was solved. Of the several mathematical papyri that have come to light in recent years the most elaborate is that transcribed by Ahmes about 1700 B.C., from one written probably some six or eight centuries earlier. Mathematics in Egypt, however, made but slight progress beyond this point until the Greek ascendancy in Alexandria. The Babylonians were the next to show signs of mathematical power, particularly in the application of arithmetic and geometry to astronomy. To them is due the suggestion of the sexagesimal system of fractions developed by the Greeks and still commonly used in angle and time measurements. The extensive trade of the Phœnicians also developed a commercial arithmetic among themselves and their neighbors, but it did not lead to any general scientific progress.

The real beginning of mathematics as a steadily progressing science is to be found in Greece, and in particular in the establishing of the Ionian school of Thales (q.v.) about 600 B.C. Geometry as a science here makes its appearance. The next great step in the progress of mathematics was taken by Pythagoras (q.v.) in founding his famous school at Crotona in southern Italy. Under his influence a considerable part of elementary geometry became developed, and a beginning was made in creating a theory of numbers. (See NUMBER.) Considerable progress had been made in geometry before the third epoch-making step was taken, the founding of the Athenian school about 420 B.C. Hippocrates of Chios began the movement that made Athens the mathematical centre for the next century and a half. It was Plato, however, who brought the school to the zenith of its fame. Although he was not, strictly speaking, a mathematician, his ideas concerning the methods of establishing truths in philosophy and science gave a powerful impulse to the progress of mathematics. The third century B.C. saw the rise of the great Alexandrian school, where Euclid taught and where Archimedes, Apollonius, and Eratosthenes studied. With that century closes the Hellenic ascendancy in mathematics and philosophy, and thenceforth we find scientific progress sporadic and short-lived. By the second century of our era progress had practically ceased. Heron and Ptolemy were the greatest of the later Greek writers on applied geometry. The only new movement in mathematics made by the post-Christian Greeks was that of Diophantus, whose work on equations is the first of any pretensions ever composed. The Romans did almost nothing in mathematics except in a purely mercantile way, their only contribution being to the practical work of surveying. Among the later Romans the name of the philosopher Boëthius stands out with some prominence for his textbook work in elementary mathematics, but he displayed no originality. The same must be said for such mediæval writers as Alcuin, Gerbert (see SYLVESTER), and Bede.

Meanwhile mathematics had obtained a foothold in the East. The Chinese early showed a taste for the science, particularly as related to astrology and astronomy. The first definite trace of really satisfactory work among the Oriental peoples, however, is that of Aryabhatta early in the sixth century A.D. Aryabhatta possessed considerable knowledge of the theory of numbers, of algebra, and of the first principles of trigonometry. The next Hindu mathematician of great prominence was Brahmagupta, who lived in the seventh century, and whose work on arithmetic and algebra and on the mensuration of solids is a distinct advance on that of his predecessors. The list of prominent Hindu mathematicians includes the name of Mahavir (Mahaviracarya), and closes with Bhaskara in the twelfth century, in whose work a fairly well developed algebraic symbolism is found. It was among the Hindus, too, that our present numeral system started, being by them transmitted, through the Arabs, to Europe. (See NOTATION; NUMERALS.) One of the most interesting periods in the development of mathematics is that of the Arab ascendancy, and in particular that of the founding of the great school at Bagdad. In this school one of the first teachers was Al Khuwarizmi, who gave the name to algebra in the ninth century. He was followed by several writers of prominence, but, if we except the science of trigonometry, it is rather by their preservation of Greek and Hindu learning than by their own originality that they are noteworthy. Among the last of the Persian and Arab writers was the poet Omar Khayyam, whose work in algebra showed considerable power. The work of the Arabs in Spain was rather that of teaching than of contributing to scientific advance.

The first of the European writers to contribute in any large way to the advance of mathematics was Leonardo of Pisa, at the opening of the thirteenth century. His *Liber Abbaci* placed before Italian scholars the Hindu number system (already slightly known) and the mathematical knowledge of the world at that time. The period of the Renaissance was one of great activity in mathematics. This activity was inaugurated in Austria by Regiomontanus and Peuerbach and in Germany by Widmann. In Italy Paccioli was the first to publish, in 1494, any modern printed work of much importance on mathematics, although an edition of Euclid had already (1482) appeared, besides several minor works, notably one on arithmetic printed at Treviso in 1478 and two printed at Bamberg in 1482–83. During the sixteenth century the Italian algebraists, notably Tartaglia, Ferro, Cardan, Ferrari, and Bombelli, solved completely the cubic and biquadratic equations, and Vieta, in France, so improved the symbolism of algebra and so generalized the use of letters as to put algebra upon substantially the present foundation. It needed only the symbolism suggested by Descartes and a few of his contemporaries to bring elementary algebra, about 1650, to the form familiar to students at the present day.

About the time that elementary algebra was becoming crystallized a revival of interest in

geometry took place. On the side of pure geometry this was led by Kepler, Desargues, and Pascal, while to Fermat and Descartes is due the invention of the method of analytic geometry. At the same period Fermat laid the foundation for the modern theory of numbers, and the new theory of logarithms (q.v.) became generally known. The greatest progress in the seventeenth century is, however, represented by the invention of the fluxional calculus by Newton and of the differential calculus by Leibnitz. These disciplines, essentially the same and so considered at present, revolutionized mathematics and its applications.

The period of the development of elementary mathematics closes with the seventeenth century. The eighteenth century was devoted largely to the investigations of the foundations of the new analysis, to a consideration of its applications, to the study of infinite series (see SERIES), and to the understanding of the nature of complex numbers (q.v.). The nineteenth century saw the development of the so-called modern mathematics, including subjects discussed in the articles on SUBSTITUTION; QUATERNIONS; SURFACE; CURVE; COMPLEX NUMBER; DETERMINANTS; FUNCTION; and the more general articles on ALGEBRA, GEOMETRY, TRIGONOMETRY, NUMBER, and CALCULUS.

Classification. No entirely satisfactory classification of mathematics is possible. The various branches are so interrelated that exact lines of separation cannot be drawn, a fact of apparent and great advantage to the science. The most recent attempt at classification is that made in the *Encyklopädie der mathematischen Wissenschaften.* The following scheme covers the principal subjects discussed:

I. PURE MATHEMATICS

A. Arithmetic and Algebra.

(*a*) Arithmetic (q.v.).

(1) Fundamental operations with pure numbers. See NUMBER; ARITHMETIC.
(2) The combinatory theory, including combinations, permutations, determinants. See PERMUTATIONS AND COMBINATIONS.
(3) Irrationals and the convergency question. See NUMBER; IRRATIONAL NUMBER.
(4) Complex numbers (q.v.).
(5) Mengenlehre, literally the "multitude theory"; as of a multitude (unlimited number) of points.
(6) Finite discrete groups. See SUBSTITUTION.

(*b*) Algebra (q.v.).

(1) Fundamental concepts, including rational functions. See FUNCTION.
(2) Theory of invariants. See FORMS.
(3) Theory of equations. See EQUATION.

(*c*) Theory of numbers. See NUMBER.

(*d*) Theory of probabilities. See PROBABILITY.

B. Analysis.

(*a*) Analysis of real quantities.

(1) Differential and integral calculus. See CALCULUS.
(2) Differential equations. See EQUATION.
(3) Continuous transformation groups. See SUBSTITUTION.
(4) Infinite series.
(5) Calculus of variations.

(*b*) Analysis of complex quantities.

(1) General theory of functions. See FUNCTION.
(2) Special kinds of functions, elliptic, Abelian, automorphic, etc.
(3) Functional equations and operations.

C. Geometry (q.v.).

(*a*) Pure geometry. See GEOMETRY.

(1) General principles and elementary geometry.
(2) Positional geometry.
(3) Projective geometry. See GEOMETRY; PROJECTION.
(4) Descriptive geometry. See GEOMETRY.

(*b*) Algebra and analysis as applied to geometry. See ANALYTIC GEOMETRY.

(1) Coördinate systems. See COÖRDINATES.
(2) Conics.
(3) Algebraic curves and surfaces.
(4) Space of *n* dimensions. See GEOMETRY.

(*c*) Differential geometry, including transcendental curves and surfaces.

II. APPLIED MATHEMATICS

A. Mechanics (q.v.), including kinematics, kinetics, statics, the vector analysis (see QUATERNIONS), hydrodynamics, and the theory of elasticity.

B. Physics (q.v.), including thermodynamics, molecular physics, electricity, optics.

C. Geodesy and Geophysics, including navigation, geodetic mensuration, cartography, magnetism.

D. Astronomy.

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MATHER, măth'ĕr, COTTON (1663–1728). A colonial divine and author, eldest son of Increase Mather (q.v.) and Maria, daughter of John Cotton (q.v.). He was born in Boston, Feb. 12, 1663. He was very precocious and was unfortunately overestimated and praised, with the result that he became morbidly self-conscious. An omnivorous reader from the first, he entered Harvard at 11 and graduated in 1678 at 15. At 16 he studied medicine, despairing of being able

to enter the ministry on account of a propensity to stammering. This he conquered by methods of deliberate speech, and at 17 preached his first sermon and became an assistant to his father. He took his master's degree in 1681, refusing a call to New Haven, and became associate pastor with his father in the North Church of Boston. In 1686 he married; two years later his father's mission to England left him at the age of 25 in sole charge of the North Church, and probably the most important man in Boston. He was widely celebrated as a scholar and was the obvious leader of the conservative element among the Puritans of the day. He had also begun to take a great interest in the subject of witchcraft, his *Memorable Providences Relating to Witchcraft and Possessions* appearing in 1689. During the witchcraft epidemic at Salem in 1692 he became an infatuated investigator of suspected cases, a constant adviser of the magistrates, and wrote his *Wonders of the Invisible World* (1693) to confute all doubters. In 1693 Mather planned his great ecclesiastical history of New England, the *Magnalia*, which was finished in 1697 and finally appeared in 1702. Meanwhile he was overworked and much troubled by attacks made upon him for his activity in the witchcraft crisis. He was also much worried by his father's troubles as president of Harvard, and later was disappointed in not himself receiving the position. He had family troubles, and was furthermore doomed to see more liberal forms of religious thought prevailing around him. Nevertheless, he continued to be a prominent and useful citizen, waging war on intemperance and other forms of immorality. In 1703 he married again. In 1707 a final breach with Governor Dudley greatly lessened his public influence. A few years later he was made a D.D. by the University of Glasgow, but tributes to his merits as divine, scholar, and author could not compensate for domestic unhappiness caused by various deaths and by the dissolute conduct of one of his sons. His second wife dying in 1713, he took another two years later and suffered greatly in consequence of her derangement. In 1721 by his bold stand in favor of inoculation for smallpox he aroused a storm of opposition to himself. Then came his father's death, a final disappointment with regard to the presidency of Harvard, and his own death, Feb. 13, 1728.

Cotton Mather was a man of extraordinary learning, a stanch upholder of antiquity, especially in matters of theology and Church polity, a marvelously voluminous writer, an active politician, and, when not misled by excitement, a public-spirited citizen. His connection with the persecution of the witches has given him a sinister reputation, which no efforts of biographers have been able to efface; but it is certain that he was sincere in his beliefs, and not thoughtlessly cruel; and he is better remembered than any other of the early colonial divines. Few persons can now find time to read his numerous books, but no student of the period during which he lived should speak of him without gratitude. His *Magnalia* is full of errors, yet gives the very "form and presence" of its age and represents labors truly heroic. The most important of his works are: *Poem to the Memory of Urian Oakes* (1682); *Wonders of the Invisible World* (1693; reprinted in "Library of Old Authors," 1862); *Magnalia Christi Americana* (1702; reprinted in two volumes, 1820 and 1853); *Bonifacius*, etc., or, as it is better known, *Essays to Do Good* (1710; Glasgow, 1838); *Parentator* (Boston, 1724), a curious and interesting life of his father, Increase. His *Diary* (c.1687–1708) was published in 1911 by the Massachusetts Historical Society. Consult: for his life and writings the biography by his son, Samuel Mather (Boston, 1729); Enoch Pond, *The Mather Family* (ib., 1844); M. C. Tyler, *History of American Literature*, vol. ii (New York, 1881); Barrett Wendell, *Cotton Mather* (ib., 1891); A. B. Marvin, *Life and Times of Cotton Mather* (Boston, 1892); Barrett Wendell, *Literary History of America* (New York, 1900); also G. L. Kittredge, "Some Lost Works of Cotton Mather," in *Massachusetts Historical Society, Proceedings*, vol. xlv (Cambridge, 1912), and J. P. Quincy, "Cotton Mather and the Supernormal in New England," in the same, series 2, vol. xx (ib., 1907).—Cotton Mather's son, SAMUEL (1706–85), graduated at Harvard in 1723, served as minister of the North Church, Boston, until 1742, and then, in consequence of differences concerning revivals, a separate church was formed for him in North Bennett Street. He published among other works a *Life of Cotton Mather* (1729); *An Apology for the Libertie of the Churches in New England* (1738); *America Known to the Ancients* (1773).

MATHER, FRANK JEWETT, JR. (1868–). An American art critic and professor. He was born at Deep River, Conn., and graduated from Williams College in 1889 and from Johns Hopkins University (Ph.D.) in 1892; he studied also at Berlin and at the Ecole des Hautes Etudes, Paris. From 1893 to 1900 he served as instructor and assistant professor of English and Romance languages at Williams College, and thereafter was professor of art and archæology at Princeton. He was an editorial writer for the New York *Evening Post* and assistant editor of the *Nation* (1901–1906) and art critic for the *Post* (1905–06; 1910–11); from 1904 to 1906 was American editor of the *Burlington Magazine;* contributed frequently, chiefly on art subjects, to the *Nation*, the *Burlington Magazine, Art and Progress*, and other periodicals; and published *Homer Martin, Poet in Landscape* (1912), and a volume of short stories, *The Collectors* (1912).

MATHER, INCREASE (1639–1723). A colonial divine, youngest son of Richard Mather (q.v.). He was born at Dorchester, Mass., June 21, 1639. A precocious boy, he entered Harvard at 12 and graduated at 17. On his nineteenth birthday he preached an able sermon from his father's pulpit. Shortly afterward, at the request of his brothers, Samuel and Nathaniel, he went to Dublin, where, at Trinity College, he took his M.A. Then he preached in Devonshire and Guernsey with success, but returned to Massachusetts in 1661. For some time he divided his services between his father's church at Dorchester and the new North Church at Boston, but in 1664 he threw in his lot with the latter.

In 1681, on the death of Urian Oakes (q.v.), Mather was appointed his successor as president of Harvard, and began his duties, but his church would not let him go. In 1685, after the death of President John Rogers, he was enabled to accept the post on the condition that he should still reside in Boston. He held it until 1701, the college growing under his care, but suffering

from various dissensions. Mather objected to leaving Boston for the rural obscurity of Cambridge, but was finally forced to reside at the college, and soon after gave up the post, which had been rendered most uncomfortable to him. Meanwhile he had made himself useful to the colony by resisting the attempts of Charles II to seize the charter of Massachusetts, had patriotically opposed the tyranny of James II, and in 1688 had gone to England as agent for his fellow citizens. He could not secure from William III the restoration of the old charter, but he obtained a new and fairly satisfactory one, and gained the favor both of the King and of the people of the colony. Fortunately for him, he was absent in England during the worst of the witchcraft delusion, in which his son Cotton took a prominent part. It is plain, however, that after this excitement wore off the hold of Mather and his son Cotton upon the clergy and people of the colony was greatly weakened. He maintained his personal vigor to a considerable extent, until his death, Aug. 23, 1723. Chief among his works are: *A Brief History of the War with the Indians in New England* (1676; edited by Drake, 1862); *A Relation of Troubles of New England from the Indians* (1677; edited by Drake, 1864); *Cometographia, or a Discourse Concerning Comets* (1683); and best known and most interesting probably, *An Essay for the Recording of Illustrious Providences* (1684; reprinted in the "Library of Old Authors," 1856). The last-named book is usually known as *Remarkable Providences* and is a mine for those interested in seventeenth-century superstitions. His *Cases of Conscience Concerning Witchcraft* (1693; reprinted with Cotton Mather's *Wonders of the Invisible World* in the "Library of Old Authors," 1862) is interesting and important. For Increase Mather's life, consult: Cotton Mather's biography of him entitled *Parentator* (Boston, 1724); Enoch Pond, *The Mather Family* (ib., 1844); Barrett Wendell, *Cotton Mather* (New York, 1891); A. B. Marvin, *Life and Times of Cotton Mather* (Boston, 1892); also: M. C. Tyler, *History of American Literature*, vol. ii (New York, 1881), and Williston Walker, *Ten New England Leaders* (ib., 1901). For a list of his voluminous writings, consult Sibley, *Harvard Graduates*, vol. i (Cambridge, 1873).

MATHER, Richard (1596–1669). A colonial divine and founder of the famous Mather family in New England. He was born in Lowton, Lancashire, of a family of Puritan yeomen. He began giving religious teaching when a mere boy, then passed through Brasenose College, Oxford, and about 1619 was ordained and put in charge of the church at Toxteth, near Liverpool. In 1635 he emigrated to Massachusetts. As he was noted for his learning and his powerful preaching, there was rivalry among the New England churches to secure him. He finally settled at Dorchester in 1636, and remained there as pastor until his death, April 22, 1669. He wrote public letters on matters of Church government, helped to compile the *Bay Psalm Book* (q.v.), and had a leading share in framing the Cambridge Platform (1648). (See Congregationalism.) He transmitted his powers, especially his love of reading and writing books, to his six sons by his first wife, Katharine Holt; his second marriage with the widow of the famous John Cotton (q.v.) proved childless. Four of these sons became somewhat famous as preachers and authors. Of these the best known is the youngest, Increase Mather (q.v.). —The eldest, Samuel (1626–71), began preaching in Boston, soon removed to England, where he was very popular, and, after the ejection of the Nonconformists in 1662, became a leading clergyman of Dublin.—The third son, Nathaniel (1631–97), also attained reputation in England as a preacher and religious writer, and succeeded his brother Samuel in Dublin.—The fifth son, Eleazer (1637–69), was the first minister at Northampton, Mass. For sketches of Richard Mather, consult: Increase Mather, *Life and Death of Richard Mather* (Cambridge, Mass., 1670); Cotton Mather, *Parentator* (Boston. 1724); M. C. Tyler, *History of American Literature*, vol. ii (New York, 1881); Barrett Wendell, *Cotton Mather* (ib., 1891).

MATHER, Robert (1859–1911). An American lawyer and railroad official, born in Salt Lake City. He graduated from Knox College (Illinois) in 1882, and in 1886 was admitted to the Illinois bar at Chicago, where he practiced for three years. He was local attorney (1889–94), assistant general attorney (1894), general attorney (1894–1902), and general counsel (1902–09) of the Chicago, Rock Island, and Pacific Railway Company. In 1904–09 he served as president of the Rock Island Railway Company, and thenceforth was chairman of the board of directors of the Westinghouse Electric and Manufacturing Company which he reorganized. He was an officer and director in other important financial, railroad, and industrial concerns.

MATHER, Thomas (1856–). An English electrical engineer, born at Higher Walton, near Preston. Educated at Owens College, Manchester, and at the Normal School of Science, London, he became a fellow of the Royal Society in 1902 and professor of electrical engineering at the City and Guilds College, South Kensington, in 1909. He assisted in determining the exact value of the electrical units and improved practical instruments for measuring electricity and universal shunts. On these subjects he wrote many papers for the Physical Society of London (of which he was vice president), for the Royal Society, and for the Institution of Electrical Engineers. He published *Exercises in Electrical Engineering* (1910), with Howe, and *Practical Electricity* (1911), with Ayrton, whose assistant he was for many years.

MATHER, Sir William (1838–). An English engineer and promoter of technical and industrial education. He was born in Manchester, was educated in Germany, and rose to be chairman of the engineering firm of Mather and Platt, Ltd., of Manchester. In 1883 Mather made a study of technical education in America and Russia for the Royal Commission on Technical Instruction; in 1908 he was chairman of the British education section of the Franco-British Exhibition; and he became chairman of the Fröbel Educational Institute, London. Between 1885 and 1904, though not continuously, he represented various Lancashire divisions in Parliament in the Liberal interests. In 1902 he was knighted and honorary degrees were given him by Princeton and Manchester universities.

MATHER, William Williams (1804–59). An American geologist, born at Brooklyn, Conn. He was educated for the military profession and graduated in 1828 at West Point, where he was assistant professor of chemistry, mineralogy, and

geology from 1829 to 1835. He resigned from the army in 1836 in order to devote himself to physical science, and became professor of chemistry at the University of Louisiana, from which position he retired in a few months to superintend the geological survey of the first district of New York State, including the counties bordering upon the Hudson River. While engaged in these researches (1836–44) he was State geologist for Ohio (1837–40) and Kentucky (1838–39), and professor of natural science, vice president, and acting president at the Ohio University at Athens (1842–50). By experiments made at Athens (1845) he discovered that bromine, which at that time was selling at $16 an ounce, could be obtained at a comparatively small price from the bitter waters of the salt works near that place. Mather collected a cabinet of over 22,000 mineralogical specimens. He was State agricultural chemist for Ohio (1850–54), edited the *Western Agriculturalist*, and was the author of the "Geology of the First Geological District," in *Natural History of New York* (1843), and of *Elements of Geology*.

MATHERS, măth'ĕrs, Helen Buckingham. See Reeves, Mrs. Henry.

MATHESON, măth'e-son, Arthur James (1842–1913). A Canadian statesman. He was born at Perth, Ontario, and was educated at Upper Canada College and at Trinity College, Toronto. He was called to the bar in 1870 and practiced his profession in Perth, where he also entered municipal life and became mayor (1883–84). He was a Conservative member of the Ontario Legislature in 1894–1913 and was Provincial Treasurer in 1905–13 in the administration of Sir James P. Whitney (q.v.). He was a member of the Ottawa Interprovincial Conference (1906), of the National Conference on State and Local Taxation (1907), and vice president for Canada of the International Commission (1910). In 1908 he was made king's counsel. He entered the militia in 1866, served on the frontier during the Fenian raids (1866–70), winning promotion, and was made lieutenant colonel in 1886 and brigadier general in 1900.

MATHESON, George (1842–1906). A Scottish minister and author, born in Glasgow. He lost his eyesight in his youth, but entered the University of Edinburgh and graduated with honors in 1861. His first charge was at Innellan, Argyllshire (1868–86); afterward he became minister at St. Bernard's, Edinburgh (1886–99). He was author of the hymn "O Love that Wilt Not Let me Go." His publications include: *Aids to the Study of German Theology* (1873; 3d ed., 1876); *The Growth of the Spirit of Christianity* (2 vols., 1877); *Natural Elements of Revealed Theology* (1881); *My Aspirations* (1883); *Can the Old Faith Live with the New?* (1885); *Distinctive Messages of the Old Religion* (1893); *Bible Definition of Religion* (1898); *Studies of the Portrait of Christ* (2 vols., 1899–1900); *The Representative Men of the Bible* (1902); *Leaves for Quiet Hours* (1904); *The Representative Women of the Bible* (1907). Consult his *Life* by D. Macmillan (London, 1907; new ed., New York, 1911).

MATHESON, Samuel Pritchard (1852–). A Canadian Anglican prelate, born at Kildonan, Manitoba, and educated at St. John's College, Winnipeg. Ordained a priest of the Church of England in Canada in 1876, he was appointed canon of St. John's Cathedral, Winnipeg, in 1882; dean of Rupert's Land and prolocutor of the General Synod of Canada in 1902; and was consecrated Coadjutor Bishop of Rupert's Land in 1903. He was elected Bishop of Rupert's Land and Metropolitan, with the title of Archbishop, in 1905 and Primate of all Canada in 1909. Successively he served as professor of exegetical theology in, and warden and chancellor of, St. John's College, Winnipeg. He was elected honorary president of the Moral and Social Reform Council of Canada; was a delegate to the Pan-Anglican Congress, London, England (1908); and a delegate to, and honorary president of, the Anglican Church Congress, Halifax (1910).

MATHEW, măth'ū, Theobald, commonly known as Father Mathew (1790–1856). A total-abstinence orator. He was born at Thomastown, a few miles east of Tipperary Castle, in Ireland, Oct. 10, 1790. On the death of his father, while Mathew was still very young, the kindness of the Llandaff family enabled the boy to enter the Roman Catholic College of Kilkenny, whence he was transferred, as a candidate for the Roman Catholic priesthood, to the College of Maynooth in 1807. He left that college, however, in the next year. He relinquished the secular priesthood for that of the religious Order of the Capuchins, in which he took priest's orders in 1814 and, after a year in Kilkenny, was sent to the church of his order in the city of Cork, where he remained for 24 years. He established a religious brotherhood similar to that of St. Vincent de Paul, and he founded schools for children of both sexes. But the great work of Father Mathew's life is the marvelous reformation which he effected in the habits of his fellow countrymen and which has won for him the title of Apostle of Temperance. In 1838 he established an association on the principle of total abstinence, at first confined to the city of Cork, but afterward extending to the county and adjacent districts of Limerick and Kerry. The success which attended this first local effort led to the suggestion that Father Mathew himself should repair to the several great centres of population, especially in the south. Thence he gradually extended the field of his labors to Dublin, to the north, and even to Liverpool, Manchester, London, Glasgow, and the other chief seats of the Irish population, even in the New World. His association included a large proportion of the adult population of Ireland, without distinction of rank, creed, or sex; and so complete was the revolution in the habits of the Irish people that very many distilleries and breweries ceased from working. Mathew's munificent charities, especially during the Irish famine of 1846–47, the expenses connected with his total-abstinence association, and perhaps his own unworldly habits, involved him in pecuniary embarrassments and embittered his last years. A pension of £300, granted by the crown in 1847, was supplemented by private subscription and relieved him of his liabilities. In 1848 he had an attack of paralysis, from which he never fully recovered. From 1849 to 1851 he was in America and founded numerous total-abstinence societies. He died at Queenstown, Ireland, Dec. 8, 1856. Consult his *Life* by J. F. Maguire (London, 1869; abridged, 1890), by F. I. Mathew (ib., 1890), and by Tynan (ib., 1908).

MATHEWS, măth'ūz, Charles (1776–1835). An English comedian, born in London on June 28, 1776. He was the son of a bookseller, who

intended his son to follow the same vocation; but Charles's early inclination for the stage overcame parental counsel, and he made his appearance as an amateur, in the part of Richard III, at the Richmond Theatre in 1793. As a professional comedian, he appeared in the Theatre Royal, Dublin, the following year. In 1803 he made his first appearance in London at the Haymarket, playing the part of Jabel in *The Jew* by Cumberland. In 1818 he first introduced in London one of his entertainments, known as *At Homes*, such as he repeated for a number of subsequent seasons with immense success. In the course of his career he twice visited America, in 1822 and 1834, and his last appearance upon the stage was made at New York in February, 1835. He had been since 1828 a joint proprietor of the Adelphi Theatre of London. His death occurred at Plymouth on June 28, 1835. Mathews was a wonderful master of impersonation and mimicry. The variety of his facial expression was so extraordinary that he could alter his curious features in an instant and deceive even his friends as to his identity, a peculiarity of which many quaint stories are told. He was extremely sensitive, and the fineness of his taste and character, as well as his wit, made him a welcome companion of the most distinguished people. Charles James Matthews (q.v.), his son (1803–78), became even better known as an actor than his father. Consult: Mrs. Mathews, *Memoirs of Charles Mathews, Comedian* (London, 1838–39); id., *Anecdotes of Actors* (ib., 1844); Baker, *Our Old Actors* (ib., 1881); Matthews and Hutton, *Actors and Actresses of Great Britain and the United States*, vol. ii (New York, 1886).

MATHEWS, Charles James (1803–78). An English actor and playwright, son of Charles Mathews, born in Liverpool, Dec. 26, 1803. He was educated at Merchant Taylors' School and at a school at Clapham kept by Richardson the lexicographer. In 1819 he began study with Pugin, the architect. With Pugin he went to Paris, whose comedians increased a lurking disposition of his to appear on the stage. He did so as an amateur in April, 1822, playing the part of Dorival in *Le comédien d'Etampes* at the Lyceum Theatre. He afterward designed and superintended the building of cottages, inns, and bridges. In 1835 he gave up his profession and turned to the stage. Though a brilliant actor in light pieces, he met with many reverses as manager. During his long career on the stage he played, in England and America, more than 200 rôles in dramas written by himself and others. Among his most famous parts were Charles Coldstream in *Used Up*, Lavater in *Cool as a Cucumber*, and Puff in the *Critic*. Besides performing at the principal London theatres, Mathews made tours through Canada, the United States, and Australia. He died at Manchester, England, June 24, 1878. Consult Charles Dickens, *Life of C. J. Mathews* (London, 1879).

MATHEWS, Edward Bennett (1869–). An American mineralogist, brother of Shailer Mathews (q.v.). He was born at Portland, Me., and graduated in 1891 from Colby College and in 1894 (Ph.D.) from Johns Hopkins, where he was instructor in mineralogy and petrography (1894–95), associate (1895–99), associate professor (1899–1904), and professor after 1904. He was also a field assistant of the United States Geological Survey in 1891–94, and in 1898 became State geologist of Maryland. His writings include: *Bibliography and Cartography of Maryland* (1897); *The Maps and Map-Makers of Maryland* (1898); *An Account of the Character and Distribution of the Maryland Building Stones* (1898); *The Counties of Maryland, their Origin, Boundaries, and Election Districts* (1907); *The Limestones of Maryland* (1910).

MATHEWS, Joseph McDowell (1847–). An American surgeon, born at Newcastle, Ky., and educated professionally at the University of Louisville (M.D., 1867). He established himself in practice at Louisville and became professor of surgery in the Louisville Hospital College of Medicine. In 1899–1900 he served as president of the American Medical Association. He is the author of *Diseases of the Rectum, Anus, and Sigmoid Flexure* (1893; 3d ed., 1903) and of *How to Succeed in the Practice of Medicine* (1902).

MATHEWS, Shailer (1863–). An American New Testament scholar, editor, and author. Born at Portland, Me., a brother of Edward Bennett Mathews (q.v.), he was educated at Colby College (A.B., 1884; A.M., 1887), and graduated from the Newton Theological Institution in 1887. He returned to Colby to be associate professor of rhetoric (1887–89) and professor of history and political economy (1889–94). In 1890–91 he studied at Berlin. At the University of Chicago he was associate professor (1894–97) and professor (1897–1905) of New Testament history and interpretation, professor of systematic theology (1905–06), professor of historical and comparative theology after 1906, also junior dean of the Divinity School (1899–1908), and dean after 1908. He was president of the Western Economic Society after 1911 and of the Federal Council of the Churches of Christ in America after 1912, and served as editor of *The World Today* in 1903–11 and of the *Biblical World* after 1913. His publications include: *Select Mediæval Documents* (1892; 2d ed., 1900); *The Social Teaching of Jesus* (1897; rev. ed., 1908); *A History of New Testament Times in Palestine* (1899; rev. ed., 1910); an excellent study of *The French Revolution* (1901; 4th ed., 1904); *The Messianic Hope in the New Testament* (1905); *The Church and the Changing Order* (1907); *The Social Gospel* (1910); *The Gospel and the Modern Man* (1910); *Scientific Management in the Churches* (1912); *The Making of To-Morrow* (1913).

MATHEWS, William (1818–1909). An American author, born at Waterville, Me. He graduated at Waterville College (Colby College) in 1835, studied law at Harvard, and was admitted to the bar. In 1841 he established the *Watervillonian*, afterward called the *Yankee Blade*, which united with the Boston *Portfolio* in 1856. He was also in newspaper work in Chicago from 1859 until 1862, when he was appointed professor of rhetoric and English in the University of Chicago, a position he resigned in 1875. His publications include: *Getting On in the World* (1872); *The Great Conversers, and Other Essays* (1874); *Words: Their Use and Abuse* (1876); *Hours with Men and Books* (1877); *Oratory and Orators* (1879); *Literary Style* (1881); *Men, Places, and Things* (1887); *Wit and Humor: Their Use and Abuse* (1888); *Nugæ Literariæ* (1896); *Conquering Success* (1903).

MATHEWS, William Smythe Babcock (1837–1912). An American musician and writer on music. He was born in Loudon, N. H., and was educated entirely under American teachers.

From 1891 to 1902 he was the editor of *Music*, a journal devoted to the interests of students of music. For many years this paper was an important influence in the musical life of America, but gradually it lost its prestige through overconservatism and increasing opposition to the music of Wagner. His publications include: *Outlines of Musical Form* (1867); *Emerson Organ Method* (1870), in collaboration with L. O. Emerson; Pianoforte Technics (1876), with William Mason; *How to Understand Music* (2 vols., 1880, 1888, respectively); *Popular History of Music* (1889); *One Hundred Years of Music in America* (1889); *Pronouncing Dictionary of Musical Terms* (1896), with Emil Liebling; *Music: Its Ideals and Methods* (1897).

MATHIAS, mȧ-thī'ȧs, THOMAS JAMES (c.1754–1835). An English author. He was educated at Trinity College, Cambridge, of which he became a fellow, and was appointed treasurer of the household to Queen Charlotte. This office he resigned in 1818 and passed the later part of his life at Naples. During his long residence in Italy he became thoroughly acquainted with its language and literature and wrote Italian verses with considerable fluency. But his principal service to Italian literature was his edition of Tiraboschi's standard work, *The History of Italian Poetry* (1805). His best work is *The Pursuits of Literature*, a poem which was published anonymously between 1794 and 1797. The chief interest of the *Pursuits* lies in its satirical critical notes, which made a sensation at the time.

MATICO, mȧ-tē'kō (Sp., from South American name). *Piper angustifolium* or formerly known as *Artanthe elongata*. A shrub of the family Piperaceæ, a native of Peru, where it is known as soldiers' herb, because its hairy leaves are used as a styptic. The name is also applied to a species of *Eupatorium* (q.v.).

MATICO. A South American armadillo (q.v.) (*Tolypeutes conurus*), allied to the apar.

MATIL'DA. A town in Ontario, Canada. See IROQUOIS.

MATIL'DA (1102–67). Daughter of Henry I, King of England, and wife of the Emperor Henry V, often known as the Empress Maud. After her husband's death in 1125 she returned to England, and in 1126 her father compelled the barons of the realm to swear that they would accept her as his heir. In 1128 she was married to Geoffrey Plantagenet, son of the Count of Anjou. In 1133 she gave birth to a son, who was to ascend the throne of England as Henry II. When Henry I died in 1135, Matilda immediately claimed all his possessions, but was opposed by her cousin Stephen of Blois. In Normandy she was successful, but in England Stephen was generally accepted as King, though Matilda was loyally supported by her half brother Robert of Gloucester. In 1141 she was for a time victorious; Stephen was captured and even his brother Henry, Bishop of Winchester and Papal Legate, submitted to her rule. But the nobles of England found her too haughty and rose against her authority, and her cause was hopelessly lost until Henry was old enough to participate in the contest. After Henry II came to the throne she used her influence with the King for the preservation of peace in the Kingdom and sought to be mediator between him and Becket (q.v.). Consult J. H. Round, *Geoffrey de Mandeville: A Study of the Anarchy* (London, 1892).

MATILDA (1046–1115). Countess of Tuscany, noted through her close connection with the Papacy during its struggle with the Emperor Henry IV. She was a daughter of Boniface II, Count of Tuscany, and Beatrice of Lorraine. In 1070 she married by procuration Godfrey (surnamed *Il Gobbo*, i.e., "the Hunchback"), Duke of Lorraine. Her husband did not join her until 1072, and died in 1076. After this Matilda made herself conspicuous by the zeal with which she espoused the cause of Gregory VII, and it was at her castle of Canossa that Henry IV in 1077 made his humiliating submission to the Pope. In 1089, though 43 years of age, she contracted a nominal marriage with the 18-year-old Welf, the son of Welf, Duke of Bavaria, in order to gain additional support for Gregory's successor, Urban II, but the marriage was dissolved in 1095. When she died (July 24, 1115), the Papacy claimed her extensive territories, comprising Tuscany, Brescia, Modena, Reggio, Mantua, and Ferrara, on the ground that in 1077 she had made the Church her heir. This produced a new conflict between Papacy and Empire. In the course of this contest the cities rose to great power and asserted their independence. Consult: Luigi Tosti, *La contessa Matildȧ ed i romani pontifici* (2d ed., Rome, 1886); Overmann, *Gräfin Mathilde von Tuscien: Ihre Besitzungen. Geschichte ihres Gutes von 1115–1320 und ihre Regesten* (Innsbruck, 1895); M. E. Huddy, *Matilda, Countess of Tuscany* (St. Louis, 1905); Nora Duff, *Matilda of Tuscany* (London, 1910).

MATILDA CASE. See CHASE, S. P.

MATILE, mȧ-tēl', GEORGE AUGUSTE (1807–81). A Swiss-American jurist, born at La Chaux-de-Fonds (Neuchâtel). He studied law at Berlin and Heidelberg, and still later in Paris. He was admitted to the bar (1838) at Neuchâtel, and eight years afterward was appointed professor of law at the university there, and judge of the Supreme Court. He came to America in 1849, and in 1856 was made professor of history at Princeton. In 1858 he removed to the University of Pennsylvania as professor of French literature. From 1863 until his death he was connected with the State Department in Washington. His works include: *Points de coutume* (1838); *Autorité du droit romain de la coutume de Bourgogne et de la Caroline dans la principauté de Neuchâtel* (1838); *Musée historique de Neuchâtel* (1841–59); *Monuments de l'histoire de Neuchâtel* (1844–48); *Histoire de la seigneurie de Valangin* (1852).

MÂTIN, mä'tăn' (OF. *mastin, mâtin*, from ML. **manusuetinus*, from *mansuetare*, to tame, from *mansuetus*, p.p. of *mansuescere*, to tame, from *manus*, hand + *suescere*, to become accustomed, inchoative of *suere*, to be accustomed). A large kind of dog, now almost peculiarly French, but allied to the Great Dane. It has rough hair, a rather flat forehead, a rather pointed muzzle; the ears are erect, but bent down at the tips. It is generally of a whitish color, clouded with brown. It is fierce, but not very courageous. Compare HOUND.

MA'TINS. See CANONICAL HOURS; BREVIARY.

MATISSE, mȧ'tēs', HENRI (1869–). A French painter and sculptor, chief leader of the movement known as Post Impressionism (q.v.). He was born at Cateau (Nord), and studied at the Ecole des Beaux-Arts, Paris. For four years (1795–99) he painted in the conventional style; then, coming under the influence of Cézanne, he launched a new school. Rejecting all art of the

past, and especially the use of nature as a standard of beauty, Matisse attempts a return to primitive, childlike art, without reference to the conventional or the natural appearance of objects. "Simplification, organization, expression"—these are the oft-quoted watchwords of his manner; they perhaps explain his method. He possesses abundant vitality, is a capable draftsman, and has a keen sense of the decorative; but to the uninitiated or to those who have a different idea of what may be called art, his work seems grotesque, purposely defective, and therefore insincere. His peculiar style can best be studied in the Stein collection, Paris. Matisse was well represented in the International Exhibition of Modern Art, New York, in 1913, especially by paintings. Among some of the much discussed examples of his work in this kind are the decorative panels "Dance" and "Music," "The Woman with the Green Eyes," and a portrait of himself. A representative and retrospective exhibition of drawings, lithographs, paintings, and sculpture was held at the Montross Galleries, New York, in February, 1915. Among the most notable of the sculptures were the powerful "Serf"; nude women in various postures; and four versions of a "Woman's Head." The paintings included the well-known "Coucous," "Nude Model Posing," "Gold Fish," and "Young Sailor." Consult: Fritz Burger, "Henri Matisse," in *Cézanne und Hodler: Einführung in die Probleme der Malerei der Gegenwart*, vol. i. (Munich, 1913); J. G. Huneker, "Matisse, Picasso and Others," in *The Pathos of Distance* (New York, 1913).

MAT'LOCK. A town of Derbyshire, England, situated amid beautiful scenery, 17 miles northwest of Derby. It is noted for its fine scenery, hot mineral springs, baths, and stalactite caves. Manufactures include cotton and bleach goods and paper; there are lead mines near by. Pop., 1901, 5980; 1911, 6745.

MATOS FRAGOSO, mä'tôsh frä-gō'sô, JUAN DE (?1614–1689). A Spanish-Portuguese dramatist, born at Alvito (Alemtejo), Portugal, about 1614. After becoming licentiate in the humanities and jurisprudence at Evora, he went to Madrid, became intimate with Pérez de Montalbán, and thus obtained a hearing on the stage. His earliest play known to us, *La defensa de la fé y príncipe prodigioso*, was published in 1651, and a dozen more appeared in 1658. Despite his popularity and his insistence upon the "point of honor," he is no longer read. Seven of his plays appear in vol. xlvii of the *Biblioteca de autores españoles*.

MA'TRIAR'CHATE (from Lat. *mater*, Gk. μήτηρ, *mētēr*, mother + ἀρχός, *archos*, ruler, from ἄρχειν, *archein*, to rule). Any social group, as a family, a clan, or a tribe, ruled by a woman or by women. The term has been used in ethnology since the publication in 1865 of Bachofen's *Das Mutterrecht*, in which it was shown that in all races there exist survivals of a metronymic period when children took the mother's name, instead of the father's name, and when property also descended in the female line. Such a system is still in full force among the North American Indians, and has been carefully described by Morgan in his *League of the Iroquois* in 1849. As an existing system it may even now be observed among the Damaras of South Africa, the Congo tribes of West Africa, the inland negroes, the Kasias of Bengal, the Tahitians and Tongans of Polynesia, and the Hovas of Madagascar. This system, however, is in fact only metronymic, and everywhere falls short of being matriarchal. There is no proof that mankind has passed through a stage of clan or tribal rule by women, although in his account of the Iroquois Long House Morgan presents a picture of a rigorous control of domestic affairs by a matron. Moreover, in the Iroquois clan a position of importance and respect was accorded to women. They voted in the council of the clan, on equal terms with men. In various African and Polynesian tribes women have held the most exalted position, that of queen of a tribal confederacy. This, however, was no such "matriarchy" as was at one time imagined by ethnologists disposed to believe that a patriarchal system had been preceded by one in which woman's relative importance was as great as that of man at a later time became. More complete investigations have shown that under metronymic organization it is not the wife and mother who exercises an authority over children which the husband does not possess. The authority really lies in the hands of the woman's nearest male kinsman, that is, her brothers, or her maternal uncles. These male kinsmen even exercise authority over husbands who have come to live among them. Consult: Dargun, *Mutterrecht und Raubehe* (Breslau, 1883); J. J. Bachofen, *Das Mutterrecht* (2d ed., Basel, 1897); E. A. Westermarck, *History of Human Marriage* (3d ed., ib., 1902); Charles Letourneau, *Evolution of Marriage* (ib., 1911).

MATRICARIA. See CHAMOMILE.

MATRIC'ULA'TION (from ML. *matriculare*, to enroll, from Lat. *matricula*, register, diminutive of *matrix*, roll, origin, womb, from *mater*, mother). A term denoting in a general sense enrollment or admission to membership in any body or society, specifically in a college or university.

MATRIMONIO SEGRETO, mä'trē-mō'nē-ō sä-grā'tō, IL (It., The Secret Marriage). An opera bouffe by Cimarosa, first produced in Vienna, Feb. 7, 1792; in the United States, Jan. 4, 1834 (New York).

MA'TRIX, IN MATHEMATICS. See DETERMINANTS.

MA'TRONA. See MARNE.

MAT'RONA'LIA (Lat., neu. pl. of *matronalis*, relating to a matron). A festival of Juno Lucina (see JUNO), celebrated at Rome by the married women and maidens of the city on the first of March. It typified the sacredness of married life and commemorated the dedication of the temple of Juno on the Esquiline, to which in the festival the matrons marched in procession with offerings for the goddess. Consult W. W. Fowler, *Roman Festivals* (London, 1899).

MATRONS, JURY OF. In English legal procedure, an extraordinary jury, composed of "matrons or other discreet women," impaneled under special circumstances to determine whether a woman is quick with child—the only instance in which women were eligible to serve as jurors at common law. It may be employed both in civil and in criminal cases where the fact of pregnancy is in issue or where a legal right turns upon the fact. In civil cases the question may arise in suits for the annulment of marriage on the ground of the concealed pregnancy of the wife resulting from an illicit connection with another man than her husband before marriage, in cases of pedigree where there

is need of a safeguard against the fraud of a supposititious child and the like. The writ *de ventre inspiciendo*, as it is called, is issued by the Court of Chancery to the sheriff and directs him to summon a jury of women to investigate and report whether the woman named in the writ is with child or not and, if so, at about what date her delivery may be looked for. The procedure is of very ancient origin and is said to have been borrowed from the civil law of Rome. It was frequently employed in the Middle Ages and there are several instances of its use in the last century as late as 1845. Though it has not been employed since that date it is still available as a matter of right if demanded. The fact that modern medicine furnishes a surer method of ascertaining the existence of pregnancy, has, in practice, led to the practical abandonment of the jury of matrons in such cases.

In criminal cases the jury of matrons was obligatory and directed by the court on the demand of a woman convicted of felony that execution of the sentence be suspended until she had given birth to a child of which she claimed to be pregnant. The common law from motives of humanity, and in order that a child which had quickened in the womb should not also lose its life for the mother's crime, provided for the postponement of the death penalty till the child had been safely delivered. The woman was entitled as matter of right after sentence to plead her pregnancy in answer to the question, "What have you to say for yourself in stay of the execution of the sentence which has been given against you?" The course usually followed is for the clerk, immediately upon the plea being made, to impanel a jury of 12 from the women present in court. The jury then retire with the prisoner to make the necessary examination and for this purpose may have the assistance of a competent physician. They may also hear the testimony of medical men offered either in the interests of the prisoner or of the crown and given in open court. In order that the verdict of the jury shall operate as a reprieve it is not sufficient that the bare fact of pregnancy be found. The verdict must declare that the prisoner is "with quick child." As in civil cases the modern tendency is to employ a medical examination in all cases of alleged pregnancy, and in New York and several other States the jury of matrons has been abolished by statute and a jury of medical men (usually six) substituted in their stead. This is also the French procedure. In England, however, the old practice of summoning a jury of matrons in such cases still obtains. The last instance of its use appears to have been in the case of *Regina* v. *Katherine Webster*, in 1879, reported in the *Times*, July 9, 1879. Consult: J. F. Stephen, *History of the Criminal Law* (London, 1883); Sir William Blackstone, *Commentaries on the Laws of England* (4th ed., Chicago, 1899); Edward Chitty, *Criminal Law* (4 vols., London, 1816); Taylor, *Medical Jurisprudence* (5th ed., ib., 1905); *Encyclopedia of the Laws of England*, vol. ix (2d ed., ib., 1907). See PREGNANCY.

MATSUE. See MATSUYE.

MATSUKATA, mät'sōō-kä'tȧ, MASAYOSHI, MARQUIS (1835–). A Japanese statesman, born in Satsuma, the son of a samurai. After the revolution he became head of one of the new prefectures and took a prominent part in the tax reform of 1875. He became Minister of Commerce in 1880, of Finance in 1881, and cabinet president with the portfolio of Finance in 1891. He retired in 1893, but in 1896 formed a new cabinet, became Minister of Finance, introduced the gold standard, which put Japanese credit on a firm basis, and retired in December, 1897, because of opposition to his programme of taxation. In 1898–1900 he was again Finance Minister. He was made Privy Councilor in 1903, and for some years was president of the Japan Red Cross Society. His title of Marquis he held after 1906, having previously been Count since 1884.

MATSUMAI, mät'sōō'mī, or **MATSUMAYE,** mät'sōō-mä'yĕ. A seaport of Japan. See FUKUYAMA.

MATSUMOTO, mät'sōō-mō'tȯ. A town of Japan in the District of Nagano, situated nearly in the centre of the island of Hondo, 100 miles northwest of Tokyo (Map: Japan, E 5). It lies in a wide fertile plain surrounded by mountains, and contains a picturesque remnant of an old daimyo castle. It manufactures silks, baskets, and preserved fruits. Pop., 1903, 33,493; 1908, 35,011.

MATSUMURA, mät'sōō-mōō'rȧ, NINZO (1856–). A Japanese botanist, born in Ibaraki-Ken, of a samurai family. He took a great interest in botany as a young man and after he was 30 studied in Würzburg and Heidelberg (1886–88). In 1883 he had been made assistant professor of botany in the University of Tokyo, and in 1890 became professor and in 1897 director of the Botanical Gardens. He assisted in the preparation of Brinkley's *Unabridged Japanese-English Dictionary* (1896), and he published many important works on the flora of Japan, including: *Nomenclature of Japanese Plants in Latin, Japanese, and Chinese* (1884), *Names of Plants and their Products in English, Japanese, and Chinese* (1892), *Conspectus of Leguminosæ* (1902), *Index plantarum Japonicarum: Cryptogamæ* (1904), *Phanerogamæ* (1905); with Ito, *Tentamen Floræ Lutchuensis* (1899) and *Revisio Alni Specierum Japonicarum* (1902); with Hayata, *Enumeratio Plantarum in Insula Formosa Sponte Crescentium* (1906).

MATSUNAGA, mät'sōō-nä'gȧ, RYŌHITSU. A prominent Japanese mathematician, born at Kurume in Kiushu, or possibly at Terauchi in Awari. He died in 1744. His former name was Terauchi Gompei, and he is also known as Matsunaga Yoshisuke. He received the mathematical secrets of the Seki (q.v.) school from Araki (died in 1718), under whom he studied. His best-known work, the *Hoyen Sankyo* (1739), is devoted entirely to formulas for the circumference and arcs of circles. In this he gives the value of π to 50 figures.

MATSUOKA, mät'sōō-ō'kȧ, YASUKOWA (or KOKI) (1846–). A Japanese statesman and administrator, born in Tokushima, Awa Province, of a samurai family. He entered the Department of Justice in 1871; traveled in Europe to study judicial methods in 1886–87; became a crown member of the House of Peers in 1891; was Procurator General in 1892 and Vice Minister of Home Affairs in 1894 and 1898; presided over the Administrative Litigation Court in 1898–1906; and in 1906–08 was Minister of Agriculture and Commerce. He was president of Japan University, a private institution. Matsuoka was a political adherent of Yamagata.

MATSUSHIMA, mät'sōō-shē'mȧ. A small

village on the Bay of Sendai, on the east coast of northern Hondo, Japan, of which, in a shallow lagoon, lies a group of 808 tiny islets and rocks (also called *Matsŭshima*, or Pine Islands), ranging in height from 30 to 300 feet, rising steeply out of the water and covered with pines and stunted brushwood, forming a beautiful natural garden. It is one of the "three natural wonders" of the coast; the other two are found at Miyadzu and Miyajima (qq.v.).

MATSUYAMA, mät'sōō-yä'mȧ. A town of Japan, capital of the District of Ehime and of the former Province of Iyo. It is situated in the western part of the island of Shikoku, 5 miles from its port, Mitsu, with which it is connected by a railroad (Map: Japan, C 7). It is chiefly noted for its large feudal castle, formerly the seat of a daimyo, which was one of the few preserved as specimens by the Imperial government when feudalism was abolished. Pop., 1903, 37,842; 1908, 44,166.

MATSUYE, mȧt-sōō'yȧ, or MATSUE, mä'-tsōō-ȧ. A town of Japan, capital of the District of Shimane and formerly of the Province of Idzumo. It is situated on a small inlet of the Sea of Japan, on the north coast of the great southwestern peninsula of the island of Hondo, 140 miles northwest of Kyoto (Map: Japan, C 6). It is a clean, prosperous city, with numerous temples, and is noted for the manufacture of paper and the polishing of agates. Pop., 1903, 35,081; 1908, 36,209.

MATSYS, mät'sīs', **MASSYS, METSYS, MESSYS,** QUINTEN (c.1460–1530). One of the most eminent painters of the early Flemish school. According to the most critical modern opinion, his birthplace was not Antwerp, as was formerly supposed, but Louvain. Here he studied, probably under a pupil of Dierick Bouts, for his earliest works show the influence of that master. The charming traditions of his early life, how the smith of Louvain became a painter for love of a painter's daughter, etc., deserve no credence. He removed early to Antwerp, where he was enrolled in the painters' guild in 1491, passed most of his life, and died in 1530. In Matsys's art Flemish painting of the fifteenth century reached its culmination, but he is also the earliest representative of the new era of the sixteenth century, when the Italian influence began to make itself felt in the Netherlands. He was one of the first to give to the human figure marked prominence and to understand the value of gesture and of unity of composition. Rejecting the miniature forms of his predecessors, he painted the figures life size, and subordinated detail to the general effect. His color is rich, but good in values, and subordinated to a luminous silvery tone. Among his earlier paintings are a series of "Crucifixions," the best being in the Liechtenstein Gallery, Vienna, and the Mayer van der Bergh collection, Antwerp, and a "Pietà" in the Louvre.

One of his greatest surviving works is the altarpiece for St. Ann's chapel in the church of St. Peter at Louvain, now in the Brussels Museum, completed in 1509. The subject of the centre panel is the "Family of St. Ann." The figures are nobly and solidly represented, but without dramatic expression. On the other hand, the scenes from the "Life of St. Ann" on the wings of the altar are strongly dramatic. His masterpiece is the great triptych in the Antwerp Museum, representing the "Burial of Christ," flanked by the "Martyrdom of the Two Johns" (1509–11). The action of this work is intense, and the color, though gorgeous, is well harmonized. His other works include an "Enthroned Virgin," Berlin Gallery; two half-length devotional figures of "Christ" and the "Virgin" at Antwerp and "an Adoration of the Kings" in the Metropolitan Museum, New York.

His few surviving portraits are strong and realistic and show a skillful rendition of character. Genuine examples are those of Ægidius at Longford Castle; of Jean Carondelet in the Pinakothek, Munich; Erasmus in the Stroganoff Palace, Rome; the "Man with the Eyeglasses" in the Städel Institute, Frankfort; and the "Choir Master" in the Liechtenstein Gallery. By emphasizing the worldly occupation of the sitters, as in his well-known "Banker and his Wife" (1514, Louvre), he prepared the way for the genre picture of the future. Consult Walter Cohen, *Studien zur Quinten Metsys* (Bonn, 1904), and Jean de Bosschère, *Quentin Metsys* (Brussels, 1907).

MAT'TATHI'AS (the Gk. form of the Heb. *Mittithyāh*, or, more correctly, *Mattathyāh*, gift of Yahwe). The name of several individuals of the Maccabæan period of Jewish history, the most noted of whom was the aged priest of the Hasmonæan family (cf. 1 Macc. ii), who started the revolt against Syria (168 B.C.) and whose sons, Judas, Jonathan, and Simon, brought it to a successful issue. See MACCABEES.

MAT'TAWA, mät'ȧ-wȧ, or **MATTAWAN,** mät'ȧ-wŏn. A town in Nipissing District, Ontario, Canada, at the east end of Lake Timiskaming, at the junction of the Ottawa and Mattawa rivers, 45 miles east of North Bay (direct), and on the Canadian Pacific Railroad (Map: Ontario, F 1). It is an important distributing point for lumbering districts, and a favorite rendezvous for moose-hunting parties, sportsmen, and anglers. The town has an electric-lighting plant. There are large mica deposits in the vicinity. Pop., 1901, 1400; 1911, 1524.

MATTAWA RIVER. A tributary of the Ottawa River, Canada. It has its source in Trout Lake, near Lake Nipissing, and after an eastward course of 50 miles flows into the Ottawa River at Mattawa Town. Prior to the railway era it was an important trading route from upper Ottawa to the Great Lakes and is much resorted to for the fine angling it affords. Lake Huron, at an earlier stage in its history, drained through Lake Nipissing and the Mattawa River to the Ottawa.

MATTEAWAN, mät'ȧ-wŏn'. Formerly a village in Dutchess Co., N. Y., merged in 1913 with the village of Fishkill Landing (q.v.) to form the new city of Beacon (Map: New York, A 1). It has the State Hospital for the Criminal Insane, Highland Hospital, and the Howland Circulating Library. Good water power is afforded for manufacturing, and its industries are represented by wool and straw hat shops, machine shops, silk and embroidery mills, etc. Matteawan was founded in 1814, and its population in 1910 was 6727 (excluding the patients in the insane asylum).

MATTE (mät) **COPPER.** A combination of the metal and sulphur, other elements occurring in minor proportions. It is the product formed by smelting ores containing sulphur, copper, and (usually) iron. It is essentially a mixture of cuprous sulphide (Cu_2S) and FeS, and almost

always carries a small amount of magnetite as an impurity. It has great affinity for silver and gold and collects these metals when they occur in the furnace charge, a property which is fully utilized in metallurgy. The copper and iron are replaceable by any or all of the heavy metals, nickel, cobalt, lead, manganese, etc., and also to a small extent by the alkalies and alkali earths. The sulphur may be replaced in part by antimony, arsenic, selenium, and tellurium, but when any great amount of the sulphur is so replaced, the compound assumes different characteristics both chemically and physically, and is then known as speiss. Matte assumes different colors as the sulphur content changes and is known from these appearances as blue metal, white metal, or regulus. The further treatment of matte always consists of an oxidation, the sulphur being expelled as sulphur dioxide; the iron oxidized to ferrous oxide, which is combined with silica to form a fusible slag, while that portion of the copper first oxidized reacts with the unchanged sulphide to form sulphur dioxide, leaving the metallic copper carrying silver and gold. See COPPER, section on *Metallurgy*.

MATTEO DI BASSI, mät-tā′ō dē bäs′sē. An Observantine Franciscan, founder of the Order of the Capuchins (q.v.).

MAT′TER (OF. *matière, matere, matire,* Fr. *matière,* from Lat. *materia,* matter; connected with Skt. *mā,* to measure, build). In ordinary language, the material world is discriminated from the world of mind, although it is conceded that all our knowledge of the former comes to us through sensation. In so far as matter is conceived as the basis of the reality of the physical world, the term designates the object matter of all physical science. It is defined in physical treatises wholly by its properties.

PROPERTIES OF MATTER

From the standpoint of physics, the properties of matter may be classified as inertia, weight, and various characteristics of size, shape, and molecular connections. When one changes the motion of a piece of matter in any way one is conscious of a definite sensation, the intensity of which depends upon two things—the suddenness of the change and the quantity of the matter, using this word "quantity" in a general sense. This sensation, being associated with matter, is said to be due to a definite property of matter, which is called its "inertia" (q.v.). Again, if a portion of matter is held in the hand and so kept from falling towards the earth, there is a definite sensation which is attributed to a property of matter called "weight." It can be shown that if our senses were delicate enough they would experience a similar sensation when any two pieces of matter, e.g., two bullets, were held a small distance apart. See GRAVITATION.

There are a great many properties common to all kinds of matter, but to different degrees; while other properties are confined to certain forms of matter, e.g., solids or liquids or gases. A *solid* has a definite shape and size of its own, which can, however, be changed by the application of certain forces. Some solids, e.g., copper, have *ductility* (q.v.) and can be drawn out into wires; some have *malleability* (q.v.) and can be hammered out into thin sheets; some have *porosity* (q.v.) and allow various other portions of matter to pass through them; some are "glazed" and are nearly impervious to other portions of matter; some are hard, others soft; some are brittle, others tough; some are plastic, like putty, etc.

A *liquid* is such a form of matter that, if left to itself in air (or in any gas or other liquid with which it does not mix), it forms a spherical drop, or, if contained in a hollow solid here on the surface of the earth, it takes the shape of the vessel, keeping a constant volume. A liquid has then certain molecular properties in its surface which make it contract as far as possible. See CAPILLARITY.

A *gas* is such a form of matter that, being contained within any closed vessel, it distributes itself uniformly throughout the space open to it; thus having neither a shape nor a size of its own. (See GASES, GENERAL PROPERTIES OF.) Gases and liquids are called *fluids* because they can flow; they yield to any force, however small, which is acting in such a direction as to make one layer move over the other. (See HYDROSTATICS.) Some bodies behave as liquids to feeble but long-continued forces, but as solids to intense and sudden forces; shoemaker's wax will flow so as to fill a tumbler if time is given, but it may be broken by a sudden blow, just like a piece of glass.

All forms of matter are divisible into smaller parts. (See following paragraphs on *Theories of Matter.*) They are also more or less "elastic"; that is, if the shape or size of a solid is deformed slightly by a small force, or if the volume of a fluid is so changed, they will return to their previous conditions more or less perfectly when the deforming force is removed; this proves the existence of internal molecular forces of restitution. (See ELASTICITY.) Whenever the shape of a solid is changed—not the shape of the whole solid necessarily, but the shape of the little cubical portions out of which the body may be imagined constructed—there is always to some degree a slipping of the layers of matter over each other, and corresponding internal or molecular friction. Similarly, if currents are produced in fluids, there is more or less friction between the layers, which is attributed to a property called *viscosity* (q.v.). In the case of liquids there is a superficial viscosity also, which is made manifest when a body floating on the surface is moved.

A property common to all forms of matter is that of "diffusion"; if two portions of different kinds of matter are brought closely together—"in contact"—it is believed that there is always a passage across the bounding surface of molecules of the two kinds of matter. Sometimes this passage can be actually observed, e.g., in the case of any two gases, two such liquids as water and alcohol, two such solids as lead and gold.

Since matter as such has so many properties, inertia, weight, size, elasticity, etc., two portions of matter may have some properties in common and not others. Therefore, if two portions of matter are to be defined as equal, or to have equal quantities, it is necessary to select some basis of comparison. By *definition,* two portions of matter are said to have equal quantities—or equal "masses"—if they have the same inertia; the experimental test being imagined somewhat as follows: Subject one body to the propulsive action of a compressed spring, measure its velocity along a smooth horizontal table; compress the same spring to the same

amount as before, allow it by its expansion to set in motion a second body, and measure its velocity; if these two velocities are the same, the two bodies have the same inertia.

Newton, and later Bessel, proved that the acceleration of a falling body towards the earth at any one place on the earth's surface is a constant for all kinds and amounts of matter. (See GRAVITATION.) Call it g. The weight of a body of mass m is mg; and so if two bodies have the same mass, as defined above, they also have the same weight, and conversely. Consequently the mass of a body is always in practice measured by comparing its weight with that of a combination of standards. A standard body is chosen, a gram; other bodies of the same mass are made; others whose masses are fractions or multiples of that of the standard; etc. Such a set of bodies is called a "set of weights."

It is believed that matter as such is indestructible; that is, however it changes its form or whatever reactions it undergoes, a portion of matter preserves its mass unaltered. This idea, which is entirely in accord with all experiments and observations, is called the principle of the conservation of matter. It is perfectly possible that the *weight* of a body changes as its temperature, or one of its other properties, is altered, but there is no experimental evidence in favor of such an idea. For full discussion of properties of matter, the reader may consult Tait, *Properties of Matter* (Edinburgh, 1885).

THEORIES OF MATTER

Many theories have been advanced to account for the properties of matter; some deny an objective reality to matter, others affirm it. It is possible to show that all observed phenomena in nature may be predicted from certain general mathematical equations, the quantities in which are not necessarily connected with the perceptions of man; and that our mode of interpreting these qualities in terms of matter is not the only possible one. Again, there was a theory of matter, due to Boscovich, in which all actions of matter, as revealed by our senses, are attributed to "force centres," which act on each other according to different laws for different distances. This theory fails to explain inertia.

All theories which affirm the objective reality of matter consider any portion of it as made up of "molecules" and "atoms," meaning by molecule the smallest portion of the given kind of matter which retains the properties of the whole (e.g., a molecule of copper, of water), and by atom the smallest portion obtained in chemical reactions. There are many theories of this kind, which differ in the way they regard molecules and atoms; but they all agree in one respect, they consider both the molecules and atoms to be in motion. On the idea that molecules are in motion it is possible to explain the main differences between solids, liquids, and gases and the principal features of diffusion, osmosis, evaporation, dissociation, heat conduction, fluid pressure, viscosity, etc., and in particular to deduce the most important properties of a gas. Such theories as this are called "kinetic theories." On any kinetic theory the molecules of a gas are conceived to be in motion in paths long compared with their own size, the average length of path being called the "mean free path." It is possible by identifying certain actual physical quantities, such as pressure, viscocity, diffusion, with these quantities as predicted by mathematical treatment of the simple kinetic theory of gases, to arrive at an idea as to the order of magnitude of the number of molecules in one cubic centimeter, and the length of the mean free path at different pressures, etc. The approximate number of molecules in 1 cubic centimeter at atmospheric pressure is 2.7×10^{19}, the mean distance apart of two molecules is about 2.6×10^{-7} centimeters, the mean free path is about 1×10^{-5} centimeters, and the volume actually filled by the molecules in 1 cubic centimeter is $\frac{1}{5000}$ cubic centimeter. If the pressure is diminished, these quantities all change.

If the pressure is reduced to .001 centimeter of mercury, the mean free path becomes about 1 centimeter. A space so exhausted of matter as this has special physical properties and is called a "Crookes' vacuum" or the "fourth state of matter."

In a liquid the molecules are supposed to be moving about, having encounters with each other, rebounding, etc., yet having practically no free path.

In a solid the molecules are supposed to be held more or less in fixed positions, about which they may vibrate, thus forming an elastic configuration which can be strained or even permanently deformed.

In the cases of all three—gases, liquids, and solids—while the molecules are moving about, the electrons (see ELECTRON) in the atoms forming the molecules are making immensely rapid vibrations, which produce the ether waves manifested by thermal, luminous, and chemical effects when they are absorbed. (See RADIATION.) These kinetic ideas of molecules and atoms can be used to form a concrete picture of nearly all the phenomena and properties of matter.

The question remains, What is the "atom"? One idea was that an atom is a perfectly elastic sphere, which is obviously incompatible with facts. Another theory which has been much discussed is that atoms are vortices in a perfect fluid. The simplest type of vortex (q.v.) is like a smoke ring; but there are many more complicated forms, which can be shown to be stable. A vortex once formed in a perfect fluid will maintain its identity as it moves about, not being a wave motion passing through the fluid, but always consisting of the same portion of the fluid; vortices are elastic; they can "combine," or come together and form a single system. Thus, if atoms are simply vortices of ether moving freely through the ether, many of the properties of matter may be explained. A still more recent theory of matter is based upon the fact that an electric charge has an inertia quite apart from that of the matter which carries the charge. (See ELECTRON.) Consult Ames, *The Constitution of Matter* (Boston, 1913).

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(New York, 1904); Frederick Soddy, *Matter and Energy* (ib., 1912), contains a bibliography; O. W. Richardson, *Electron Theory of Matter* (Cambridge, 1914). See ENERGETICS; LIGHT.

MATTER, mȧ'târ', JACQUES (1791–1864). A French philosopher, born in Alsace. He was educated at Strassburg, Göttingen, and Paris, and in 1820 was appointed professor of history and director of the College of Strassburg. In 1832 Guizot made him inspector general of the University of Paris. In 1845 he was chosen inspector of the French public libraries. He retired in 1846 to Strassburg to become professor in the Protestant theological seminary there. He was the author of a great number of standard works, among which are: *Essai historique sur l'école d'Alexandrie* (1820; 2d ed., as *Histoire de l'école Alexandrie, etc.*, 1840–44); *Histoire critique du gnosticisme, etc.* (1828; 2d ed., 1843–44); *Histoire universelle de l'église chrétienne* (1829–35; 2d ed., 1839); *De l'influence des mœurs sur les lois et des lois sur les mœurs* (1832; 2d ed., 1843), crowned by the Academy; *Histoire des doctrines morales et politiques des trois derniers siècles* (1836–37); *De l'affaiblissement des idées et des études morales* (1841); *De l'état moral, politique, et littéraire de l'Allemagne* (1847); *La philosophie de la religion* (1857); *La morale, etc.* (1860); *Saint Martin* (1862; 2d ed., 1864); *Emmanuel de Swedenborg* (1st and 2d ed., 1863); *Le mysticisme en France au temps de Fénelon* (1864).

MAT'TERHORN (Fr. *Mont Cervin*, It. *Monte Cervino*). The grandest mountain mass of the Alps, located near Zermatt in Switzerland, between the Canton of Valais and the Val d'Aosta in Italy, in the Pennine group (Map: Switzerland, B 3). Its height is 14,782 feet, but that fact alone gives little idea of the sublimity of its abrupt rise above the great range of which it is the sentinel peak. The vast glaciers around it have their upper sources in snows at the foot of this mighty crag, which rises on its northerly face in a sheer precipice nearly 4000 feet above them. It was deemed impossible of ascent previous to 1865, when its top was reached by Whymper, who lost four of his party in the return. Its ascent is now made less perilous by a hut built at a height of 12,526 feet, and by the familiarity of the guides with the most dangerous points, and the means to surmount them. Consult John Tyndall, *Hours of Exercise in the Alps* (New York, 1899), and Edward Whymper, *Scrambles Amongst the Alps* (5th ed., London, 1900).

MATTEUCCI, mȧt'tȧ-o̅ot'chē, CARLO (1811–68). An Italian scientist, born at Forli, Romagna. He studied the physical sciences at the Ecole Polytechnique in Paris, and through the influence of Humboldt was made professor of physics in the University of Pisa. Previously he had taught at Bologna and Ravenna. He devoted himself especially to the investigations of the physiological effects of electricity, and published his results in French, English, and Italian journals of science. He also wrote: *Lezioni di fisica* (4th ed., 1851); *Lezioni sui fenomeni fisico-chimici dei corpi viventi* (2d ed., 1846); and *Cours spécial sur l'induction, le magnétisme de rotation, etc.* (1854). In 1860 he was made Senator by the Grand Duke of Tuscany, and in 1862 for a few months he held the portfolio of Public Instruction in the Rattazzi ministry.

MATTEUCCI, RAFFAELE VITTORIO (1846–1909). An Italian seismologist, born at Senigallia, Italy. He graduated from the University of Naples; studied at the University of Heidelberg; and then investigated seismic disturbances, especially those of Mount Vesuvius. In this connection he made especially important researches. In the Vesuvius eruption of 1900 he was severely injured, but two years later he succeeded Palmiere as director of the observatory on that mountain. In 1906 he remained at his post throughout the eruption (which he had predicted) and sent messages to allay the panic in the cities below, although the building where he was stationed was wrecked.

MATTHAEI, mȧt-tā'ĕ, CHRISTIAN FRIEDRICH (1744–1811). A German classical scholar, born at Gröst, Thuringia, and educated at the University of Leipzig. From 1774 to 1784 he was professor of classical literature at the University of Moscow. In 1789 he was made professor of Greek at the University of Wittenberg. He published many valuable manuscripts from the Moscow Library, a codex of Homeric hymns, and edited *Plutarchi Libellus de Superstitione* and *Demosthenis Oratio Funebris in Laudem Atheniensium qui pro Patria Pugnando Cæsi Sunt ad Chæroneam.* He also edited, among other works, *Gregorii Thessaloniensis X Orationes* (1776) and *Novum Testamentum XII Tomis Distinctum Græce et Latine* (1788).

MATTHESON, mȧt'ȧ-zŏn, JOHANN (1681–1764). A German composer and writer on music, born at Hamburg. In 1697 he entered upon his career as a singer, and two years later sang one of the rôles and also conducted at the harpsichord his first opera, *Die Pleyaden.* From 1703 dates his acquaintance with Handel. In 1706 he obtained the post of secretary to the English Legation. In 1715 he was appointed musical director and canon at the Hamburg Cathedral, and while there did much towards developing the then unknown form of church cantata, and made the innovation of introducing female singers into his choir. In 1719 he also became court chapelmaster to the Duke of Holstein. From 1728, when deafness caused him to resign the post of musical director at the cathedral, to his death, he devoted himself largely to writing. His compositions are unimportant, but he made many excellent translations of English works on politics and jurisprudence. A man of wide culture, his numerous theoretical and historical works are remarkable for their catholicity of view, and are also of lasting value, as they were largely instrumental in firmly establishing the modern system of music. Most notable are: *Das neueröffnete Orchester, oder gründliche Anleitung* (1713); *Critica Musica* (1722); *Das forschende Orchester* (1721); *De Eruditione Musica* (1732); and *Die neueste Untersuchung der Singspiele* (1744). Consult L. Meinardus, *Johann Mattheson und seine Verdienste um die deutsche Tonkunst* (Leipzig, 1879).

MATTHEW, mȧth'ū (Lat. *Matthæus*, from Gk. *Ματθαῖος*, *Matthaios*, from Heb. *Mattithyāh*, gift of Yahwe). The Evangelist, identical with the publican whom Mark and Luke called Levi. He was the son of Alphæus. The Hebrew name Matthew, probably meaning "the gift of Jehovah," was perhaps a surname analogous to Cephas as added to Simon. He was early called to be a disciple and was afterward numbered among the Twelve Apostles. He was a publican, living at or near Capernaum, probably one of the subordinate class who were charged with collect-

ing the taxes in a limited district. Having left all to follow Jesus, he also made him a feast in his house, at which a great multitude of publicans were present as invited guests (Matt. ix. 9–13 and parallels). After the record of his choice as one of the Apostles, given by three Evangelists—of whom only Matthew speaks of himself as the publican—no mention is made of him in the New Testament, except in the group named in Acts i. 13. A tradition as old as the beginning of the second century says that the Twelve continued in Jerusalem about 12 years after the ascension. The statement of Eusebius, made long afterward, that he preached to his own nation before he went to foreign countries, accords with this. Among the countries mentioned by other writers are Ethiopia, Persia, Macedonia, Media, and Parthia. Several of the earlier writers agree in numbering him among the few Apostles who did not suffer martyrdom, though a later tradition affirms that he, too, sealed his testimony with his blood. For his relation to the Gospel of Matthew and for bibliography, see MATTHEW, GOSPEL OF.

MATTHEW, GEORGE FREDERICK (1837–). A Canadian geologist. He was born at St. John, New Brunswick, and was educated at the University of New Brunswick. He entered the civil service in 1853, became chief clerk of customs in 1879, and in 1893 surveyor of customs. He prepared in 1872, with Professor Bailey, a preliminary report on the geology of southern New Brunswick; in 1872–73 he wrote a report on the carboniferous system of that province and a summary of his observations. For many years he conducted geological observations in the Maritime Provinces. He was elected a fellow of the Royal Society of Canada and vice president of the Natural History Society of New Brunswick. He contributed geological papers to the *Quarterly Journal of the Geological Society*, *Canadian Naturalist*, *Silliman's Journal*, *American Geologist*, *Geological Magazine*, *Canadian Record of Science*, and *Transactions of the Royal Society of Canada*.

MATTHEW, GOSPEL OF. The first of the four Gospels in the New Testament. After an artificially constructed genealogy of Jesus traced through Joseph's line back to Abraham are narrated the announcement to Joseph of Jesus' coming birth, the visit of the Wise Men from the East, the flight of Joseph and his family into Egypt, Herod's massacre of the children, and the return of the fugitives "into the land of Israel" (i, ii). Then follows a brief résumé of the ministry of John the Baptist, leading up to Jesus' baptism by John and his temptation in the wilderness (iii–iv. 11). The narrative proper begins with Jesus' withdrawal into Galilee and his active entrance upon his work. The record of this work is divided into three principal parts: (*a*) his ministry in Galilee (iv. 12–xv. 20); (*b*) his ministry in the regions north and east of Galilee (xv. 21–xvii. 20); (*c*) his ministry in Jerusalem (xxi–xxv). These parts cover in general the same events as the main portions of Mark and Luke, but the events themselves are arranged in a way peculiar to this Gospel. The arrangement of material is topical rather than chronological. Thus, after a short introductory passage (iv. 12–25) there follows a lengthy discourse treating of the Messianic Kingdom—the composite address known as the Sermon on the Mount (v. 1–vii. 29). Then come a group of miracles (viii. 1–ix. 34) and a collection of sayings which are of a more general character than those contained in the Sermon on the Mount (ix. 35–xiii. 48). More miracles (xiv. 13–36) and certain sayings concerning Pharisaic traditions (xv. 1–20) complete the section which describes the Galilean ministry of Jesus. The same arrangement is carried out in the second main portion of the narrative, i.e., the ministry in the regions north and east of Galilee; but the groups in this section are all relatively small. First two miracles are related, the former of which is evidently intended to represent the mission to the Gentiles (xv. 21–39), and then follow the request of the Pharisees and Sadducees for a sign, the warning against the leaven of the Pharisees, Peter's confession in the neighborhood of Cæsarea Philippi, and Jesus' first prediction of his passion (xvi). At the end of this part the transfiguration of Christ and the healing of the epileptic are recorded (xvii. 1–20). Next comes a passage of considerable length which serves as a transition from the second to the third part of Jesus' ministry (xvii. 22–xx). It consists chiefly of discourses delivered in Galilee and on the way to Jerusalem, and here too the evangelist's tendency to arrange his material in groups is noticeable. Finally we have the account of Christ's ministry in and near Jerusalem (xxi–xxv). Here, however, apart from the introductory passage containing a record of the triumphal entry into the city, the cleansing of the temple, the objection of the chief priests and scribes, and the cursing of the fig tree (xxi. 1–19), the whole narrative is concerned with the discourses and discussions of Tuesday in Passion Week. The story of Jesus' life ends with his passion—the Passover meal, the agony in Gethsemane, the betrayal, arrest, trial, crucifixion, and burial (xxvi–xxvii). The last chapter of the Gospel records the resurrection of Christ and his appearance to the 11 Apostles in Galilee (xxviii).

From this arrangement of his material it is clear that the evangelist desired to prove to his readers that Jesus of Nazareth was the long-expected Messiah. The writer's purpose is also indicated by the prophetic setting in which the narrative is placed. The birth of Jesus, the events of his life, and the circumstances connected with his death are not looked upon as accidentally corresponding to certain Old Testament predictions. They are rather regarded as part of a divinely ordered plan, according to which Jesus is at once the fulfillment of prophecy and the consummation of theocratic history. Though reared within the pale of Judaism, he is nevertheless the Messiah of a community that is wider than the confines of Israel.

The principal sources used by the evangelist were the Gospel of Mark, probably in substantially its present form, and a document known to scholars as Q (i.e., Ger. *Quelle*, 'source'). The latter, which seems to have contained some narratives of events as well as sayings of Jesus, was written by a Jewish Christian in Palestine before the fall of Jerusalem in 70 A.D. It may indeed have antedated that catastrophe by two decades. Though this work was composed in Aramaic, the language spoken by Jesus and his companions, the author of the First Gospel made use of it in a Greek translation. According to Papias of Hierapolis, who lived in the first half of the second century, the Apostle Matthew wrote down the sayings of Christ in Aramaic; and a number of modern scholars identify Q in

its original form with the work referred to by Papias. Some critics hold that the genealogy and the stories concerning Jesus' birth and infancy in chapters i and ii are based on sources of Palestinian origin. In any case, this part of the work is of much less value from an historical point of view than the sections which are based upon Mark or Q.

It can hardly be doubted that the Gospel according to Matthew is the work of a Jewish Christian, for its presentation of Jesus (cf. v. 17, x. 6 f., xv. 24, xxiii. 2 f.) as well as its general characteristics are distinctively Jewish. Moreover, quotations from the Old Testament which are not found in the parallel sections of Mark and Luke follow the Hebrew original or an Aramaic version rather than the LXX. On the other hand there are many indications that the author held no brief for the evils of Judaism (cf. iii. 7 ff., xvi. 11 f., xxiii. 3–36) and that he was in full sympathy with the Gentile element in the Church (cf. viii. 10 ff., xxi. 43), and there are some passages which betray an ecclesiastical or catholic interest (e.g., xvi. 18 f., xviii. 16 f., xxviii. 19 f.). This combination of heterogeneous elements constitutes one of the peculiar problems of the First Gospel. Since the evangelist felt it to be necessary to explain Palestinian customs and beliefs (e.g., xxii. 23, xxvii. 15) and to interpret Hebrew and Aramaic words and phrases (e.g., i. 23, xxvii. 33, 46) for the benefit of his readers, it is clear that the latter lived outside of Palestine and spoke Greek. They may have been Jewish Christians. It is impossible, however, to determine where the Gospel was written. Palestine, Syria, Asia Minor, and Rome have been suggested by different scholars for the honor, and something can be said for each; but on the whole it seems better to render a verdict of non liquet concerning the place of composition.

The date of the Gospel according to Matthew has been much discussed. It is certainly later than Mark and the collection of Jesus' sayings known as Q; for, as we have seen, the author of Matthew uses both of these as sources for his work. With Luke, however, he seems to have been unacquainted. Was the Gospel of Matthew written before or after the fall of Jerusalem in 70 A.D.? On the one hand the capture of the city and the coming of Christ are not clearly distinguished, as we should expect them to be in a work written after the former event; but on the other hand, as we have seen, Matthew reflects views or interests of an ecclesiastical or catholic type which cannot have prevailed until the latter part of the first century. It must be remembered that indications of a later time have more weight in determining the date of the Gospel than those which point to an earlier period, for the latter may be due to the sources used. A consideration of all the available data leads the present writer to the conclusion that the Gospel of Matthew was written sometime during the last quarter of the first century (75–100 A.D.). It is not necessary to assign it to a later date.

Since the time of Irenæus, who wrote c.180–185 A.D., the First Gospel has been attributed to the Apostle Matthew; but both its style and contents preclude the possibility of its having been written by a companion of Jesus. It is certainly not a translation from an Aramaic original, nor does it represent exclusively the point of view of the first disciples. How, then, did the name of Matthew, who was by no means a prominent member of the apostolic company, become attached to the Gospel? The simplest and most plausible explanation is that he was the author of Q in its Aramaic form, which in a Greek translation was one of the two chief sources used in the composition of the Gospel. The association of the work with the name of the Apostle Matthew caused it to be highly esteemed in the Church and assured it an honored place in the canon.

Bibliography. On questions relating to the characteristics, structure, date, and authorship of Matthew, see the pertinent sections in the Introductions to the New Testament by Bernhard Weiss (Eng. trans., 2 vols., London, 1887–88), Adolf Jülicher (Eng. trans., ib., 1904), Theodor Zahn (Eng. trans. from the 3d Ger. ed., 3 vols., ib., 1909), A. S. Peake (New York, 1910), and James Moffatt (ib., 1911). E. Jacquier, *Histoire des livres du Nouveau Testament* (Paris, 1902–08), represents modern Roman Catholic scholarship. Consult also J. A. Robinson, *The Study of the Gospels* (London, 1903), and E. D. Burton, *A Short Introduction to the Gospels* (Chicago, 1906). Among commentaries the following may be mentioned—*English:* J. Morison (London, 1895); Alfred Plummer (New York, 1909); W. C. Allen, in *The International Critical Commentary* (ib., 1910); A. B. Bruce, in *The Expositor's Greek Testament* (ib., 1912). *German:* Bernhard Weiss, in H. A. W. Meyer, *Kritisch-exegetischer Kommentar über das N. T.* (Göttingen, 1898); Theodor Zahn, in his *Kommentar zum N. T.* (Leipzig, 1903); Julius Wellhausen (Berlin, 1904). The student should also consult the following works: Paul Wernle, *Die synoptische Frage* (Freiburg, 1899); Adelbert Merx, *Die vier kanonischen Evangelien nach ihrem ältesten bekannten Texte* (Berlin, 1902–05); E. D. Burton, "Principles of Literary Criticism and the Synoptic Problem," in *The Decennial Publications of the University of Chicago,* vol. v (Chicago, 1904); A. F. Loisy, *Les évangiles synoptiques* (2 vols., Paris, 1907–08); Sir J. C. Hawkins, *Horæ Synopticæ* (2d ed., Oxford, 1909); Sanday and others, *Studies in the Synoptic Problem* (Oxford, 1911); Julius Wellhausen, *Einleitung in die drei ersten Evangelien* (2d ed., Berlin, 1911).

MATTHEW OF WESTMINSTER. An imaginary name by which the supposed author of the *Flores Historiarum* was designated. Luard demonstrated that no such person ever existed, and that the *Flores* was the work of several different authors. Consult Luard's preface to his edition of the *Flores,* in three volumes (London, 1890), in the "Rolls Series."

MATTHEW PARIS, or MATTHEW OF PARIS. An English chronicler. See PARIS, MATTHEW.

MATTHEWS, măth'ūz, (JAMES) BRANDER (1852–). An American author and educator, born in New Orleans. He graduated from Columbia College in 1871 and from Columbia Law School in 1873, but he turned to a literary career. From 1892 to 1900 he was professor of literature at Columbia, and thereafter held the chair of dramatic literature. It was as a critic of the drama that he became especially known. He was one of the founders of the Authors Club and of the Players Club, both of New York; one of the organizers of the American Copyright League; a member of the American Academy of Arts and Letters and president (1913) of the National Institute of Arts and Letters; the first

chairman (1906) of the Simplified Spelling Board; and president of the Modern Language Association of America (1910). In 1907 the French government decorated him with the Legion of Honor. His writings consist mainly of essays on the theatre, of comedies, and of short stories, yet *Americanisms and Briticisms* (1892) might be classified as a linguistic study. As their titles imply, *Aspects of Fiction* (1896; revised in 1902) and *An Introduction to the Study of American Literature* (1896) enter upon other fields. *His Father's Son* (1895), a novel, deals with a New York broker's influence on his son. Sketches of New York life, called *Vignettes of Manhattan*, appeared in 1894, *Studies in Local Color* appeared in 1898, and *A Confident To-Morrow* in 1900. Matthews's dramatic criticism, which is French in tone, includes *French Dramatists of the Nineteenth Century* (1881; revised in 1891 and 1901) and *Studies of the Stage* (1894), to which may be added *The Theatres of Paris* (1880). His comedies, which are literary rather than practically dramatic, include *Margery's Lovers* (1884), *In the Vestibule Limited* (1892), and *The Decision of the Court* (1893). More recent works are: *The Action and the Word* (1900); *The Historical Novel and Other Essays* (1901); *Parts of Speech, Essays on English* (1901); *The Philosophy of the Short-Story* (1901); *Actors and Actresses of the United States and Great Britain* (5 vols., 1886), with Laurence Hutton; *The Development of the Drama* (1903); *The Short Story* (1907); *Americans of the Future and Other Essays* (1909); *Molière: His Life and Works* (1910); *Introduction to the Study of American Literature* (1911); *Shakespeare as a Playwright* (1913); *On Acting* (1914); *The Oxford Book of American Essays* (1914).

MATTHEWS, măth'ūz, Edmund Orville (1836–1911). An American naval officer, born at Baltimore. He entered the Naval Academy in 1851 and graduated in 1855. He became a passed midshipman in 1858 and a master in the same year, lieutenant in 1860, lieutenant commander in 1862, commander in 1870, captain in 1881, commodore in 1894, and rear admiral in 1898. In 1861 he served on the *Wabash* and was at the capture of the forts at Hatteras Inlet. In 1864–65 he commanded the *Sonoma* off Charleston and assisted in constructing the naval battery on Morris Island. While on this duty he commanded the naval light artillery at the battles of Honey Hill and Tullifinny Crossroads, and was also attached to the staff of Admiral Dahlgren. From 1869 to 1872 he was head of the torpedo corps of the navy and established the naval torpedo station at Newport. He commanded the *Ashuelot* (1873–77), the *Powhatan* (1881–83), and the *Brooklyn* (1885–86). He was chief of the Bureau of Yards and Docks (1894–96) and, when he retired in 1898, was president of the Examining Board; from this duty he was relieved in the following year.

MATTHEWS, Mark Allison (1867–). An American Presbyterian clergyman, born at Calhoun, Ga. He began preaching at 19; was ordained in 1887; and served as pastor in his native town (1888–93), at Dalton, Ga. (1893–96), and at Jackson, Tenn. (1896–1902). Thereafter he occupied the pulpit of the First Church at Seattle, Wash. (said to be the largest Presbyterian church in the United States), and became noted as a preacher. In addition to his pastoral duties he studied law and was admitted to the bar in 1900. In 1912 he was chosen moderator of the General Assembly of the Presbyterian Church, at Louisville. Three years later, as chairman of a committee to investigate Union Theological Seminary, he visited New York and afterward reported unfavorably to the General Assembly of 1915, held at Rochester, regarding doctrines taught in the seminary.

MATTHEWS, Marmaduke Matthews (1839–1913). A Canadian landscape painter. He was born in Warwickshire, England, and was educated at the Cowley Diocesan School, Oxford, and in London. He came to Toronto, Upper Canada, in 1860 and in 1864 removed to New York City, where he remained five years. He returned to Toronto and became one of the founders of the Ontario Society of Artists, of which he was made secretary in 1875 and president in 1894. He was one of the original members of the Royal Canadian Academy (1880). His paintings of Rocky Mountain scenery, especially well known, include "The Canadian Wonderland" and "The Conquered Portal" (Rogers Pass, Selkirk Mountains). Matthews painted also many woodland studies of old Canada and New England.

MATTHEWS, Paul (1866–). An American Protestant Episcopal bishop. He was born at Glendale, Ohio, and graduated from Princeton University in 1887 and from the General Theological Seminary, New York, in 1890. Ordained a priest in 1891, he had charge of St. Paul's and St. John's churches at Omaha, Neb., in 1891–95; at Cincinnati, Ohio, he was rector of St. Luke's from 1896 to 1904 and dean of St. Paul's Cathedral in 1904–13; and in 1913–14 he was dean of the cathedral at Faribault, Minn., and professor at the Seabury Divinity School. He was elected Bishop Coadjutor of Milwaukee in 1905, but declined; in 1914 he was elected and in 1915 consecrated Bishop of New Jersey.

MATTHEWS, Peter (?1792–1838). A Canadian patriot. He was the son of a United Empire Loyalist who fought in the Revolutionary War and who afterward emigrated to Upper Canada and settled in Pickering township. He served under Sir Isaac Brock and fought in various battles during the war of 1812–15, but in 1837 joined the insurrectionary forces under William Lyon Mackenzie (q.v.) and took part in the Upper Canada rebellion. Upon the defeat and flight of Mackenzie he was captured, tried, and, with Samuel Lount (q.v.), was executed at Toronto on April 12, 1838.

MATTHEWS, Stanley (1824–89). An American soldier and jurist, born in Cincinnati, Ohio. He graduated at Kenyon College in 1840, practiced law in Cincinnati, and was judge of the Hamilton County Court of Common Pleas in 1851–53. He was elected to the State Senate in 1855, was United States attorney for the southern district of Ohio (1858–61), and at the outbreak of the Civil War was made lieutenant colonel in the Twenty-third Ohio Regiment, of which Rutherford B. Hayes (q.v.) was major. However, he saw service only with the Fifty-seventh Ohio, of which he was colonel, and with a brigade which he commanded in the Army of the Cumberland. He resigned from the army in 1863 and was judge of the Supreme Court of Cincinnati in 1863–64. On the resignation of John Sherman he was elected to the United States Senate as a Republican and served in 1877–79. He was appointed by President Gar-

field justice of the Supreme Court of the United States in 1881. He died at Washington.

MATTHEWS, Sir Thomas (1849–). An English lighthouse engineer, brother of Sir William Matthews, born and educated in Penzance. In 1873 he became an assistant in the engineering department of the corporation of Trinity House, London (which has general supervision of English lighthouses, beacons, buoys, etc.), and in 1892 he became engineer in chief to the corporation. In 1881 he had planned the lighthouse on the island of Minicoy, north of the Maldives. For Trinity House he designed and built more than a dozen new lighthouses; greatly improved the corporation's buoy and beacon systems, notably by inventing a steel buoy with an occulting gas or acetylene light; devised a new system of fog signaling; and designed an incandescent oil burner for lighthouses. He was knighted in 1909.

MATTHEWS, Washington (1843–1905). An American physician and ethnologist, born at Killiney in Ireland. He graduated from the medical department of the University of Iowa in 1864; entered the United States army as assistant surgeon, and retired in 1895 with the rank of surgeon. He made ethnological and philological studies of North American Indian tribes, especially of the Navahos, and published: *Dictionary of the Language of the Hidatsa* (1873); *Navaho Silversmiths* (1883); *Navaho Weavers* (1884); *The Mountain Chant, a Navaho Ceremony* (1887); *Navaho Legends* (1897); *The Mystic Chant, a Navaho Ceremony* (1902). A posthumous work appeared in 1907, *Navaho Myths, Prayers and Songs,* edited by P. E. Goddard.

MATTHEWS, Sir William (1844–). An English civil engineer, brother of Sir Thomas Matthews. He was born in Penzance and was privately educated in Cornwall. Coode, Matthews, Fitzmaurice, and Wilson, the firm of engineers of which he was a member, had charge of the great harbor works at Dover, Colombo, and Singapore and were consulting engineers for harbors to the colonial crown agents. Matthews served on the admiralty committee of 1901 on naval works at Gibraltar; on the royal commission of 1906 on coast erosion; on the international technical commission on the Suez Canal (1908); and on the royal commission of 1912 on oil fuel. He was knighted in 1906.

MATTHEW (măth'ū) **TOWN.** See Inagua.

MATTHIAS, *ma*-thī'ăs (Lat., from Gk. *Ματθίας*, a shorter form of *Ματταθίας*, *Mattathias*, from Heb. *Mattithyāh*, gift of Yahwe). The disciple chosen by lot to succeed Judas Iscariot as one of the Twelve Apostles (Acts i. 15–26). This is the only reference to him in the New Testament. Later tradition (Eusebius, *Hist. Eccles.*, i, 12; ii, 1) made him one of the Seventy (Luke x. 1). He figures prominently in the fanciful legends of late Christian apocryphal literature; a Gospel of Matthias and the Acts of Andrew and Matthias deal with his doctrine and his work among the Ethiopian cannibals.

MATTHIAS (1557–1619). Holy Roman Emperor from 1612 to 1619. He was born Feb. 24, 1557, a younger son of Maximilian II. In 1577 a Catholic party in the Belgian Netherlands offered him the governorship, which he accepted. He found his authority, however, hemmed in at all points and resigned in 1581. In 1593 his brother, the Emperor Rudolph II, appointed him Governor of the Archduchy of Austria. Matthias exerted himself to suppress Protestantism, in which he had the assistance of the celebrated prelate Khlesl (q.v.). In consequence of the incapacity of Rudolph, whose oppressive acts had excited a formidable insurrection in Hungary, Matthias was formally declared by the Austrian princes head of the house of Hapsburgs in 1606. He thereupon came to terms with the Hungarian Protestants, concluding with them the Treaty of Vienna. Two years later he extorted from Rudolph, by the Treaty of Lieben, June 25, 1608, the cession of Austria, Hungary, and Moravia, and in 1611 the crown of Bohemia, of which Rudolph had been deprived by his subjects, was given to Matthias. Rudolph died without issue in 1612, and Matthias was at once chosen his successor in the German Empire. A confederation of Protestant states, known as the Union, had been established in 1608 and a Roman Catholic League had been organized in 1609. Matthias attempted unsuccessfully to bring the latter, which was under Bavarian leadership, under Austrian influence. In 1617 Matthias, who was without heirs, was compelled to have his cousin, Ferdinand of Styria, crowned King of Bohemia, and the next year King of Hungary. The Bohemians revolted against Ferdinand, enraged by the severity of his religious persecutions; the insurrection at Prague, in 1618, gave the signal for the outbreak of the Thirty Years' War (q.v.), and the last days of Matthias were embittered by the failure of all his efforts to restore peace. He died March 20, 1619. Consult J. Heling, *Die Wahl des römischen Königs Matthias* (Belgrade, 1892). See Austria-Hungary.

MATTHIAS, Gospel of. See Apocrypha, *New Testament.*

MATTHIAS I, CORVI'NUS (1440–90). King of Hungary from 1458 to 1490. He was the second son of János Hunyady (q.v.) and was elected King of Hungary in 1458, in spite of the opposition of some of the great nobles, who offered the crown to the Emperor Frederick III. The boy King fought successfully against the Emperor, who sold his claims to the crown in 1462. Matthias had in the meantime to contend against the Turks, at that time under the rule of Sultan Mohammed II. In a war of several years' duration the Hungarian arms asserted themselves successfully against the forces of the conqueror of Constantinople. After some hostilities with Stephen, Waywode of Moldavia, Matthias engaged (1468) in a war against his father-in-law, George Podiebrad, King of Bohemia, which occupied him for some years and was followed by a war with Poland, after which he again turned his arms with success against the Turks. Matthias reached the height of his power when in 1485, in a war with the Emperor Frederick III, he made himself master of Vienna, the Hapsburg capital. There he died five years later. Matthias Corvinus was a great patron of arts and letters and adorned his capital with the works of renowned sculptors, in addition to a library said to contain 50,000 volumes. He sent a large staff of literary men to Italy for the purpose of obtaining copies of valuable manuscripts. He also adorned his court by the presence of the most eminent men of Italy and Germany, and himself was an author of no mean ability. At the same time the affairs of the government were not neglected. The finances were brought into a flourishing condition, industry and commerce were promoted by wise

legislation, the army was reorganized, and justice was strictly administered. Consult Fraknoi, *Mathias Corvinus*, German translation (Freiburg, 1891).

MATTHIESEN, mät'ē-sĕn, Oscar Adam Otto William (1861–). A Danish fresco painter, born in Schleswig. He studied at the Academy of Copenhagen, in Paris, and in Rome. In 1884 he was awarded a gold medal at the Academy of Copenhagen and in 1893 was Denmark's Commissioner at the World's Fair in Chicago. He attracted attention by greatly improving the technique of the art of fresco painting, which he had studied in Rome and Pompeii during 1901–03. Afterward he was a teacher at the Kunstakademie and the Kunstgewerbemuseum in Berlin. For the palace of the Prince of Monaco at Mentone he executed decorations in fresco and stucco relief. Among his paintings are: "Bathing Dragons," "Griffenfeld at Munkholmen," "Riders" (1904–06), "Working Horses," and "Leda and the Swan" (1908).

MATTHISON, măth'ĭ-son, Edith Wynne (1875–). An American actress, born in Birmingham, England, and educated there in the King Edward Grammar School and at Midland Institute. She made her first appearance on the stage in musical comedy at Blackpool in 1896. In 1897 she joined Ben Greet's company and remained with it, except for brief intervals, for the next six years, playing a wide range of parts, including such varied rôles as Miladi in *The Three Musketeers*, Portia, Peg Woffington in *Masks and Faces*, Clara Douglas in *Money*, Lady Teazle, and Rosalind. She achieved her first notable success at the Duke of York's Theatre, 1900, when at short notice she was called upon to play the part of Violet Oglander in *The Lackey's Carnival*. In May, 1903, she created the title rôle in the revival of the fifteenth-century morality play *Everyman* and achieved a greater triumph than any before in her career. Later in the same year she repeated her success in America, where the play created something of a sensation. The following year she appeared in the United States in Goldsmith's *She Stoops to Conquer* and in a repertory of Shakespearean plays. On her return to England she was engaged by Sir Henry Irving and played Portia and Rosalind to his Shylock and Jaques. After 1905 she appeared at various times in Greek and old English plays; but, with the exception of *Everyman*, her best work was in Shakespearean repertory and in the more poetic and imaginative types of modern drama, such as *The Blue Bird*, *Sister Beatrice*, *The Piper*, and *The Arrow Maker*, all of which were produced at the New Theatre, New York, in 1910–11. She appeared in several of the plays of Charles Rann Kennedy (q.v.), her husband, with success, *The Servant in the House* being the most notable. In the spring of 1915 she took part in Granville Barker's production of *Iphigenia in Tauris* and *The Trojan Women* of Euripides, given at the principal eastern universities and colleges of the United States.

MATTHISSON, mät'ē-zŏn, Friedrich von (1761–1831). A German lyric poet, born at Hohendodeleben. Trained for the ministry at Halle, he supported himself by teaching till appointed (1794) reader to the Princess of Anhalt-Dessau, with whom he traveled in Switzerland, Tirol, and Italy. On her death (1811) he was attached to the court of Württemberg, as librarian and theatre director, and resided for some time in Italy. His prose is mediocre, his verse melodious and graceful, especially in rural description, but never strong. Matthisson's *Schriften*, as finally revised by the author, came out in eight volumes (Zurich, 1825–29). Volume ix (1833) contains a biography by Döring. Consult Boschulte, *F. Matthison, seine Anhänger und Nachahmer* (Elberfeld, 1900).

MATTIACORUM CASTELLUM. See Catti; the first article Hesse; Mainz.

MATTIACUM. See Catti.

MAT'TING (from *mat*, AS. *meatta*, from Lat. *matta*, mat). A general name for various coarse woven or plaited fibrous materials for covering the floors of rooms, passages, lobbies, etc., for doormats, for hanging as screens, for packing furniture, or for packing heavy merchandise. Matting is extensively manufactured from straw, bulrushes, grasses of several kinds, and the leaves of various palms, and forms an important article of commerce. Floor matting, now so extensively employed as a cheap, cool, and cleanly substitute for carpeting, is woven from two entirely different materials—straw, made from a species of reed or grass having culms 6 feet high, and the fibrous husk of the coconut palm, called *coir*. (See Coir.) In recent years fibre and grass rugs are extensively employed for bungalows and summer cottages or for porches or temporary furnishing. Many of these are dyed or painted in various bright colors that when new prove very attractive. Most of the straw matting comes from China or Japan; the *Bungo* matting is made from a coarse straw, and the *Bingo* matting from a finer material, which is easier to manipulate, but not so durable as the coarse straw. The loom employed is a simple hand machine, consisting merely of an upright bamboo framework, with cylindrical crosspieces above and below, over which the warp runs, the woof being woven in without a shuttle. The warp threads are of hemp, oiled to make them smooth. The straw is woven while still wet and is then dried in the sun or over slow fires. Matting is either made in sections of 2 to 5 yards, which are afterward neatly joined together into a roll of 40 yards, or the fabric is all woven in one piece, in which case it is likely to be loose in texture. To remedy this the matting is loosened and pulled down closer by coolies while it is drying over a box containing a charcoal fire.

The yarn from which coco matting is woven is sometimes spun by machinery, but it is said that the hand-spun yarn is both cheaper and better. The yarn is twisted by being rolled in a peculiar manner in the hands, the work being done by natives during the rainy season. The yarn is first bleached and then sorted into colors. The process of weaving is an arduous one, and the looms are peculiarly constructed for the purpose and very strong. The fibre and grass rugs are usually woven like a rag carpet, with the coarse filling of fibre tied together by a slender cotton warp. Such rugs are often dyed or decorated in patterns by painting.

In the United States the industry classed by the Census Bureau as mats and matting includes the manufacture of doormats, floor mattings, art squares, rugs, and carpets, of which the principal materials are grass and coir yarn. These various products are woven with cotton warp, or plaited, and differ from rugs and carpets made in the carpet factories and in establishments engaged primarily in the manufacture

of cordage, twine, jute, and linen goods, in that their chief material is not wool, cotton, or jute. The progress of the industry in the United States as classified above is shown in the accompanying table.

YEAR	Number of establishments	Wage earners (average number)	Wages	Cost of materials	Value of products	Value added by manufacture
1909	12	937	$385,434	$1,066,566	$2,431,615	$1,365,049
1904	12	625	249,104	574,168	1,242,996	668,828
1899	9	1,197	237,282	516,137	1,165,330	649,193
1889	24	383	172,874	301,591	608,625	307,034
1879	12	285	125,129	233,707	439,370	205,663

In 1914 the imports of mats and mattings for floors, comprising coir fibre, rattan, straw, etc., amounted to 25,370,152 square yards, valued at $2,097,009. In 1909 these amounts were 43,435,748 square yards and $3,290,557, and in 1904, 50,025,490 square yards and $3,609,795.

Consult *History and Manufacture of Floor Coverings* (New York, 1898).

MATTIPI, mät-tē'pē (South American name), or Frog Snake. A colubrine serpent (*Xenodon severus*) of northeastern South America, related to the hognose, and one of many similar species of the opisthoglyph subfamily Xenodontinæ. The snakes of this group are poisonous, although the enlarged posterior teeth which serve as fangs are solid and have no grooves for the transmission of poison from distinct venom glands. They are slow to bite, however, and in a healthy man the results are little more than local and temporary pain, swelling, and soreness.

MAT'TISON, Hiram (1811–68). A clergyman of the Methodist Episcopal church. He was born at Norway, Herkimer Co., N. Y. He filled pastorates at Watertown and Rome, N. Y., and in 1852 removed to New York City, where he was pastor of John Street Church and afterward of Trinity Methodist Episcopal Church in Thirty-fourth Street, which he organized. He labored with great earnestness to persuade the General Conference in 1860 to take action against all slaveholding in the church, but, failing in this, he withdrew from the Methodist Episcopal church, Nov. 1, 1861, and became pastor of St. John's Independent Methodist Church, New York City. He returned in 1865 to the denomination that he had left, and was appointed to Trinity Methodist Episcopal Church in Jersey City. The last year of his life he was district secretary of the American and Foreign Christian Union. His books and contributions to the periodical press, both in prose and verse, were numerous, including among others: *Tracts for the Times* (1843); an improved edition of *Burritt's Geography of the Heavens* (1850); *Spirit-Rapping Unveiled* (1854); *Sacred Melodies* (1859); *Impending Crisis* (1859); *Immortality of the Soul* (1866); *Resurrection of the Body* (1866); *Defense of American Methodism* (1866); *Popular Amusements* (1867). He was widely known for his vigorous opposition to political Romanism. Consult his *Life*, by Vansant (New York, 1870).

MATTIUM. See Catti; the first article Hesse.

MATTO GROSSO, mät'tô grôs'sô. A state of western Brazil, bounded by the states of Amazonas and Pará on the north, Goyaz, Minas Geraes, São Paulo, and Paraná on the east, and Paraguay and Bolivia on the south and west (Map: Brazil, F 6). Its area is estimated at 532,683 square miles. Matto Grosso is the second in size among the states of Brazil and one of the least populated, having an average of one person to each two square miles. The northern half of the state belongs to the great Brazilian plateau, and the southern is formed by lowlands, much of which is swampy and subject to inundations. There are a number of more or less isolated mountain ranges, including the Cordilheira dos Parecis, Serra Azul, Serra do Aguapehy, and Serra de Amambahy. Through the centre of the state runs the watershed which separates the drainage basins of the Amazon and La Plata rivers. The northern part of the state is drained by the Guaporé, Tapajoz, Xingu, Araguayas, and their tributaries, and the southern part by the Paraguay, Paraná, and their tributaries. Owing to the vast area of the state, climate shows considerable variation. The low, swampy depressions along the rivers have an extremely hot and unhealthful climate, while in the elevated plateaus it is more moderate and healthful, and the cool winds from the pampas sometimes reduce the temperature even to the freezing point. Agricultural land is found mainly in the valleys, while the plateaus afford good grazing. The chief industry is stock raising, together with some meat packing. The principal products are herba maté, rubber, and sugar cane. The cultivation of other agricultural products is chiefly for home consumption. The gold and diamond mines, once extensively exploited, are now abandoned. It is generally believed, however, that the mineral deposits of Matto Grosso are still very valuable. The civilized population of the state was, in 1900, only 118,025, many of whom were of mixed race, and it is estimated that there are still about 25,000 uncivilized Indians belonging to various tribes. In 1913 the total population was estimated at 300,000. The commercial centre of the state is Corumbá (pop., 30,000), on the Paraguay, and the capital is Cuyabá (q.v.). This region was not occupied by the Portuguese until the eighteenth century, the captaincy general of Matto Grosso having been organized in 1748.

MATTOLE, mät-tōl'. A small Athapascan tribe in northern California.

MATTOON'. A city in Coles Co., Ill., 170 miles south of Chicago, on the Cleveland, Cincinnati, Chicago, and St. Louis and the Illinois Central railroads (Map: Illinois, H 7). There are a Carnegie public library and reading room, the Methodist Hospital, and the Old Folks Home of the I. O. O. F. The city is the centre of a broom-corn district and carries on a considerable trade in broom corn, grain, live stock, and fruit. Among the industrial plants are repair shops of the Big Four and Illinois Central railroads, foundries and machine shops, engine works, broom factories, brick and tile works, carriage and wagon shops, flouring mills, grain elevators, and hay press. Settled and incorporated in

1855, Mattoon is governed under a revised charter of 1867, providing for a mayor, elected biennially, and a unicameral council which confirms the executive's nominations to the majority of administrative offices. The city owns and operates the electric-light plant and one of the water plants. This system furnishes water only for commercial purposes and comprises a 150-acre reservoir with a capacity of 500,000,000 gallons. Pop., 1900, 9622; 1910, 11,456; 1914 (U. S. est.), 12,218; 1920, 13,552.

MATURÍN, mä'tōō-rēn'. The capital of the State of Monagas, Venezuela (Map: Colombia, E 2). It is situated on a savanna west of the Orinoco delta and 40 miles inland from the Gulf of Paria. It has a healthful climate, with an average temperature of 80.5° F. In the surrounding region stock raising and the cultivation of coffee, cacao, sugar cane, cereals, and fruits are carried on. There are manufactures of hammocks, hats, cigars, soap, and shoes. Maturín is connected by a highway with the port of Cumaná and is the commercial centre of the plains west of the delta. Its trade is chiefly in cattle and hides. Pop., of the municipality, 1891, 15,624; urban, estimated 1915, 4358.

MATURIN, mät'ū-rĭn, CHARLES ROBERT (1782–1824). An Irish romancer and novelist, born in Dublin and educated at Trinity College. Maturin took orders in the Anglican church, became curate of St. Peter's, and is said to have been an eloquent preacher. He died Oct. 30, 1824. His novels comprise: *The Fatal Revenge* (1807); *The Wild Irish Boy* (1808); *The Milesian Chief* (1812); *Women* (1818), the author's idea of the working effects of Methodism on those who professed it; *Melmoth the Wanderer* (1820), an extravagant romance, marked by real power and fantastic *diablerie*, which made a stir in its day and by far Maturin's most notable book; *Albigenses* (1824). In these novels he essayed chiefly the supernatural romance of the Radcliffe school, though attempting also the portrayal of manners of his own or an earlier day, as in *Women* and *The Milesian Chief*. Maturin wrote plays, of which *Bertram*, produced by Kean at Drury Lane, May 9, 1816, ran for 22 nights. The others either failed or were less successful. Consult *Melmoth*, edited with memoir and bibliography (London, 1892).

MATY, mä'tē, MATTHEW (1718–76). An English writer and librarian, born at Montfort, near Utrecht, Holland, May 17, 1718. His father was a Protestant refugee from Provence, who had settled at Montfort as minister of the Walloon church there. Matthew was educated at the University of Leyden, where he graduated Ph.D. and M.D. in 1740. The next year he came to London and began practice as a physician, but he devoted much time to literature. In 1750 he started the *Journal Britannique* (suspended 1750), a bimonthly printed at The Hague. It gave in French an account of English literary news. This periodical brought Maty numerous acquaintances among men of letters. In 1751 he was elected to the Royal Society, of which he became secretary in 1765. After serving as an underlibrarian of the British Museum, he was appointed principal librarian in 1772. He died July 2, 1776. Maty helped Gibbon bring out the *Essay on the Study of Literature*, contributed to the *Philosophical Transactions* of the Royal Society, and published several independent books. His last work was the *Memoirs of the Earl of Chesterfield*, completed by his son-in-law, Justamond, and published with Chesterfield's *Miscellaneous Works* (1777).

MATZENAUER, mät'sen-ou'ĕr, MARGARETHE (1881–). An Hungarian dramatic mezzo-soprano, born in Temesvar. From earliest childhood she moved in a musical atmosphere, her father being an orchestral conductor and her mother a dramatic soprano. She began her vocal studies with Mme. Neuendorff in Graz and then continued with Antonia Mielke and Franz Emerich in Berlin. Her début at Strassburg, in 1901, as Puck in Weber's *Oberon* resulted in a three years' engagement there. From 1904 to 1911 she was a member of the Royal Opera at Munich, appearing also in the Wagner festivals held at the Prinzregenten Theater and at Bayreuth. From her first appearance at the Metropolitan Opera House, in 1911, she established herself as one of the prime favorites of American opera goers. With a voice of rare beauty and power she combines more than ordinary histrionic ability and a queenly stage presence. The extraordinary range of her voice enables her to sing both soprano and contralto rôles. Her extensive repertory includes all the Wagnerian heroines. In 1912 she was married to the tenor Edoardo Ferrari-Fontana (q.v.).

MÄTZNER, mĕts'nĕr, EDUARD ADOLF FERDINAND (1805–92). A German philologist, born at Rostock and educated there, at Greifswald, and at Heidelberg. He taught in Gymnasia at Berlin and Bromberg and was director of the famous Luisenschule in Berlin (1838–92). His earlier labors included editions of Lycurgus (1836), Antiphon (1838), and Dinarchus (1842), but he is better known for his contributions to English and Romance philology. He wrote: *Syntax der neufranzösischen Sprache* (2 vols., 1843–45); *Altfranzösische Lieder* (1853); *Französische Grammatik* (1856; 3d ed., 1884); a very valuable *Englische Grammatik* (1860–65; 3d ed., 1880–85; Eng. trans., 3 vols., London, 1874); *Altenglische Sprachproben* (1867–69; with a partial vocabulary, to M, 1872). Consult *Englische Studien*, vol. xvii (Leipzig, 1893), and *Allgemeine deutsche Biographie*, vol. lii (ib., 1912).

MATZOON'. Milk in which lactic acid fermentation has been allowed to proceed only to a certain point, differing in this way from sour milk. It is often tolerated by irritable stomachs which will not retain milk or other fermented milk foods, as kumiss or kefir. It may be prepared by boiling milk and letting it cool to 100° F. A small amount of previously prepared matzoon is then added, and the mixture kept in a warm room for 12 hours; it is then placed on ice. See KUMISS.

MAUBEUGE, mō'bēzh'. A fortified town of the first class, France, in the Department of Nord, on both banks of the river Sambre, 23 miles east-southeast of Valenciennes (Map: France, N., K 2). It is well built and defended by nine forts on both banks of the Sambre. It has manufactures of iron bars, hardware, and marble. The town has an arsenal, a communal college, a commercial school, several old convents, a museum, and a public library. Pop. (commune), 1901, 20,826; 1911, 23,209. Maubeuge was captured by the Germans, after a heavy bombardment and siege lasting nearly a month, during the European War which began in 1914. See WAR IN EUROPE.

MAUCH, mouk, KARL (1837–75). A German

traveler and African explorer, born at Stetten, Württemberg. He went to South Africa in 1863, traveled through the Transvaal, and made an excellent map of it; discovered valuable gold fields in 1867, explored the diamond fields in 1870 and 1871, and in the latter year discovered the ruined city of Zimbabwe, in Mashonaland, which he identified with biblical Ophir. In 1872 he returned to Germany, where he became a railroad official. He wrote *Reisen im Innern von Südafrika, 1865–72* (1874) and contributions to *Petermanns Mitteilungen*. Consult the biography by E. Mager (Stuttgart, 1895), and *Allgemeine deutsche Biographie*, vol. lii (Leipzig, 1912).

MAUCH CHUNK, mąk chŭnk. A borough and the county seat of Carbon Co., Pa., 46 miles west by north of Easton, on the Lehigh River, the Lehigh Canal, and the Lehigh Valley and the Central of New Jersey railroads (Map: Pennsylvania, K 5). This town marks the passage of the river through precipitous mountains and forms the eastern gateway of a highly productive anthracite region. Its unique situation on the side of the mountain, from the Indian name of which it is named, and its picturesque surroundings, with a healthful climate, cause it to be much frequented as a summer resort. Nine miles west by south of the borough are the Summit Hill coal mines, which are celebrated as among the richest in the State. Another feature of interest here is a burning mine. The coal was formerly carried by means of a gravity railroad, called the Switchback, to Mauch Chunk, the cars being elevated by cable planes and returning by a similar road to the mines. This road is now used for tourists and excursions only, and the coal is transported through a tunnel to steam railroads in Panther Creek valley. Mount Pisgah and Mount Jefferson, both ascended by the road mentioned, Prospect Rock and Flagstaff Park, all reached by cars of the local electric railway, are points from which can be gained magnificent views of the Lehigh valley. These points are about 900 feet above Mauch Chunk and 1600 feet above sea level. The borough has a public library, the Dimmick Memorial Library, the Asa Packer Park, and the jail where a number of the notorious Molly Maguires (q.v.) were hung. Its business interests lie in a very extensive coal trade, and there are also foundries and machine shops, silk mills, and car shops. The government is administered by a burgess, elected every four years, and a unicameral council. Mauch Chunk was founded in 1818 by the Lehigh Coal and Navigation Company and rapidly became a railroad and coal-shipping centre. Pop., 1900, 4029; 1910, 3952.

MAUCHLINE, mąk'lĭn. A town in Ayrshire, Scotland, on the Ayr, 10 miles south of Kilmarnock. It is surrounded by a picturesque country and is famous because Robert Burns for four years lived at the farm of Mossgiel, about 1½ miles to the north (Map: Scotland, D 4). The scenes of some of his most admired lyrics are in the neighborhood; the cottage of Poosie Nancy, theatre of the Jolly Beggars, and Mauchline Kirk, the scene of the Holy Fair, are in the town. It is a good horse and cattle market and makes cabinetwork and curling stones. Pop. (civil parish), 1901, 2572; 1911, 2441.

MAUCLAIR, mō'klâr', Camille (1872–). A French poet, critic, and novelist, born in Paris. A man of remarkable versatility, he tried his hand at poetry, the novel, literary criticism, art and social criticism, politics, the drama, and metaphysical studies. The result of unconcentrated effort is a lack of unity in his work, although Mauclair, possessing great power of reaction, is at least intensely modern. In 1905 he became Knight of the Legion of Honor. After 1903 he devoted himself mainly to art criticism. He contributed to a great many reviews and wrote short stories for *Le Journal*. His works include: *Eleusis, causeries sur la cité intérieure* (1893); *Sonatines d'automne* (1894), poems; *Couronne de clarté* (1895), a novel; *Les clefs d'or* (1896), stories; *L'Orient vierge* (1897); *L'Ennemie des rêves* (1899); *Les mères sociales* (1902); *Les Danaides* (1903); *La ville lumière* (1904); *Ames bretonnes* (1907); *L'Amour tragique* (1908)—all novels. Among his essays are: *L'Art en silence* (1900); *Gustave Ricard* (1902); *Idées vivantes* (1904). His later poems are found in *Le sang qui parle* (1904); his art criticism in *The Great French Painters* (1903); *L'Impressionnisme* (1904); *Auguste Rodin* (1905); *J. B. Greuze* (1905); *De Watteau à Whistler* (1905); *Trois crises de l'art actuel* (1906); *La religion et la musique* (1909); *Les passionnés* (1911); *De l'amour physique* (1912).

MAUD, Empress. See Matilda (1102–67).

MAUDE, Aylmer (1858–). An English author. He was educated at Christ's Hospital, London, and in the Lyceum at Moscow, where he lived from 1874 to 1897, being a tutor for three years, then a clerk, and after 1885 manager of carpet factories. In 1898 he aided the Doukhobor migration to Canada. His mother was of an old Quaker family. His wife, Louise Shanks, was born in Russia, her father being English. Maude and his wife were intimate friends of Tolstoy, whose essays, letters, plays, and tales they translated into English. He wrote, besides, *Tolstoy and his Problems* (1901), *A Peculiar People, the Doukhobors* (1904), and a two-volume authorized *Life of Tolstoy* (1908-10), which was revised by the Countess Tolstoy.

MAUDE, Cyril (1862–). An English actor and theatrical manager, born in London and educated at the Charterhouse. At an early age he began to prepare himself for the English stage, but ill health drove him to Canada. Later he came to the United States, where in 1883 he made his first appearance at Denver, Colo., playing the servant's part in *East Lynne*. He returned to London the following year and in 1886 appeared there in *The Great Divorce Case*. He made his first popular success as the Duke of Courtland in *Racing* at the Grand Theatre, Islington, in 1887. During the next five years he appeared in a great variety of rôles, and his rise to prominence was fairly rapid. In 1892 he joined Henry Arthur Jones's company at the Avenue Theatre and created the rôles of Polsom and Juxton Prall in *The Crusaders* and *Judah* respectively. He played Cayley Drummle in the notable production of Pinero's *The Second Mrs. Tanqueray* at the St. James's, May 27, 1893. From 1896 till 1905 he was joint manager of the Haymarket, where he produced and played in many of the best-known plays of this period, *The Little Minister*, *The Manœuvres of Jane*, *The Second in Command*, and *Cousin Kate*, all being brought out there during his management. After leaving the Haymarket he acquired the old Avenue Theatre, which he rebuilt and called the Playhouse. He and his company, except for short intervals, occupied this house after 1907.

In 1913–14 he visited America again and met with popular favor in a repertory of his former successes and a new play called *Grumpy*, in the title rôle of which he achieved a great personal triumph. He came to be regarded as the leading English comedy actor of his time. Consult Maude, *The Haymarket Theatre, Some Records and Reminiscences* (London, 1903).

MAUDE, Frederic Natusch (1854–). An English writer on military subjects. He was educated at Wellington College and at Woolwich and entered the Royal Engineers in 1873. He was promoted to colonel and in 1905 was made Companion of the Bath. One of the small group of English army officers who pursued intelligent and valuable studies on the art of war, Colonel Maude wrote: *Letters on Tactics and Organization* (1891); *Military Letters and Essays* (1895); *Cavalry versus Infantry* (1896); *War and the World's Life* (1907); *The Leipzig Campaign, 1813* (1908); *The Jena Campaign, 1806* (1909); *The Ulm Campaign, 1805* (1912).

MAUD MUL'LER. A poem by John G. Whittier which appeared in the *National Era*, December, 1854.

MAUDSLEY, mądz'lĭ, Henry (1835–1918). An English alienist and psychologist, born at Rome, near Settle, Yorkshire. He studied at University College, London, where he graduated in medicine in 1857. In 1859–62 he was medical superintendent at the Manchester Royal Lunatic Hospital, in 1869–79 professor of medical jurisprudence at University College, London, and in 1864–74 physician to the West London Hospital. He was made a fellow of the Royal College of Physicians in 1869 and served as Gulstonian lecturer in 1870. He edited the *Journal of Medical Science* from 1862 to 1878. Edinburgh gave him the degree of LL.D. in 1884. His best-known works are: *Body and Mind* (1870; 2d ed., 1873); *Responsibility in Mental Disease* (1874); *Physiology of Mind* (1867, 1876); *Pathology of Mind* (1867; 2d ed., 1895); *Body and Will* (1883); *Natural Causes and Supernatural Seemings* (1886; 3d ed., 1897); *Life in Mind and Conduct* (1902); *Heredity, Variation, and Genius* (1908).

MAUER JAW. See Man, Science of, *Ancient Types.*

MAUI, mä'o̅o̅-ē. One of the Hawaiian Islands (q.v.).

MAULE, mou'lā. A river of Chile, rising in the Andes 7218 feet above the sea. After flowing 140 miles in a westerly direction it empties into the Pacific Ocean about 100 miles north of Concepción and near Constitución (Map: Chile, E 5). It is navigable for 52 miles for small craft. It formed the north boundary of the territory of the Araucanians. Its upper course is used for irrigation.

MAULE. A maritime province of Chile, bounded by the Province of Talca on the north, Linares and Nuble on the east, Concepción on the south, and the Pacific on the west (Map: Chile, E 5). Area, 2475 square miles. A large portion of the surface is occupied by the Coast Range, which is well wooded and rises to an altitude of nearly 3000 feet. It has a temperate climate and abundant rainfall, but the soil is rather poor. The chief occupations are stock raising and agriculture. A branch railway line from Parral runs through the province and terminates at the port of Chanco on the coast. Pop., 1911 (est.), 117,324. The chief port is Constitución (pop., 8873). The capital is Cauquenes, situated on the railway line and having a population of 9683.

MAULMAIN, mąl'mān', or **MOULMEIN,** mōl'mān'. A seaport town, capital of the Amherst district and of the Tenasserim division of Lower Burma, at the junction of the rivers Salween and Attaran, 28 miles from the Bay of Bengal (Map: Burma, C 3). The town lies between the left bank of the river Salween and a fine range of densely wooded hills which, at a distance of from 1 to 6 miles, runs parallel with the river. Maulmain is one of the most beautiful and healthful towns of India; the mean annual temperature is 78° F., the highest mean for any month being 83° F. in April and the lowest 75° F. in January. The principal street extends for 4 miles along the river, while nearer to the hills, around the town, are the residences of Europeans and wealthy Burmese and numerous pagodas with gilded spires. The hills command an extensive view of beautiful and varied scenery. Martaban lies on the opposite river bank to the north. The native houses, built of bamboo and thatched with palm leaves, are raised on piles 10 or 12 feet from the ground. The principal buildings, besides three pagodas on the hills with an excellent view, include a public library, government offices, the new jail, a general hospital, and substantial barracks. There are several educational and charitable institutions, missionary establishments, and churches. Vessels of 10-feet draft reach the wharves and jetties at all states of the tide; at spring tide, when the rise and fall is from 20 to 23 feet, the town is accessible to vessels of the largest tonnage. A considerable trade is carried on, chiefly with Calcutta, Madras, Rangoon, and Penang. The chief industries are the manufacture of lumber, ironwork, gold and silver work, and carved ivory. The principal exports are timber, rice, cotton, horns, hides, ivory, wax, gums, drugs, lead, and copper; the imports are chiefly cotton and woolen piece goods, hardware, provisions, general merchandise, and—omitting timber, which is obtained from the neighboring teak forests—all the materials required for shipbuilding, which is an important industry. The United States is represented by a consular agent. The town dates from the British occupation of Tenasserim in 1826. The town owns its water, gas, and drainage systems. Pop., 1901, 58,446; 1911, 57,582, consisting, besides Burmese, of Hindus, Malays, Europeans, Eurasians, Chinese, Armenians, and Jews.

MAUMEE (mą-mē') **RIVER.** A river formed at Fort Wayne, Ind., by the junction of the St. Joseph and the St. Mary's rivers, flowing northeast through the northwestern part of Ohio. Its length is 150 miles, and it empties through Maumee Bay into Lake Erie at its western extremity (Map: Ohio, C 3). The city of Toledo (q.v.) stretches along its banks for 4 miles from its mouth, and the river is navigable for 12 miles to the Maumee Rapids, above which its course is followed as far as Defiance by the Miami and Erie Canal, connecting Lake Erie with the Ohio River. The chief tributaries of the Maumee are the Auglaize and Tiffin rivers, and its drainage area is 6723 square miles. Maumee Bay is for the most part shallow, but its channel has been deepened, straightened, and marked by lighthouses.

MAUNA KEA, mä'o̅o̅-nȧ kā'ȧ (Hawaiian, white mountain). The highest mountain in Polynesia. It is an extinct volcano occupying

the north and north-central portions of Hawaii, and its height is 13,805 feet (Map: Hawaii, F 4). During most of the year snow lies on its peaks, which are composed of gravel and reddish scoria. Its sides are covered with forests nearly to the summit; the lower slopes are being brought under cultivation in coffee orchards.

MAUNA LOA, lō′ä (Hawaiian, long mountain). The largest volcano in the world (though not the loftiest), occupying much of the central and south portion of Hawaii (Map: Hawaii, F 4). It is 13,760 feet in height and slopes gradually from the sea to the summit near the centre of the island, where the group of craters forms an immense caldron 1½ miles in diameter and 1000 feet deep, known as Mokuaweoweo. It exceeds by far any other volcano in the amount of lava discharged; the last great eruption (1880–81) sent a stream down the east slope 50 miles long and in some places 3 miles wide. The crater is in almost continuous activity, and large eruptions have been frequent during the past century. On the east slope is the large crater of Kilauea (q.v.).

MAUNCH. See MANCH.

MAUND. See INDIA, *Weights and Measures.*

MAUNDER, mąn′dĕr, SAMUEL (1785–1849). An English compiler, born in Devonshire. His first literary work was in connection with the *Catechisms* (1837–49), published by his brother-in-law and partner, William Pinnock, with whom he was associated also in the *Literary Gazette* of London. Among his numerous compilations are: *The Little Lexicon* (1825); *Treasury of Knowledge* (1830); *Biographical Treasury* (1838); *Scientific and Literary Treasury* (1841); *Treasury of History* (1844); *Treasury of Natural History* (1848); *Treasury of Geography* (1856)—most of which passed through many editions.

MAUNDEVILLE, mąn′de-vĭl, SIR JOHN. See MANDEVILLE, THE TRAVELS OF SIR JOHN.

MAUNDRELL, mąn′drel, HENRY (1665–1701). An English traveler. He graduated in 1685 at Exeter College, Oxford, and was curate at Bromley, Kent, from 1689 to 1695. In the latter year he was appointed chaplain to the English factory at Aleppo, Syria. He wrote *A Journey from Aleppo to Jerusalem* (1703), a valuable work often reprinted, and translated into French, German, and Dutch.

MAUN′DY THURSDAY. The Thursday preceding Good Friday, also called Holy Thursday. The origin of the name is in doubt. It is referred to the Latin *dies mandati,* the day of the mandate: "A new commandment give I unto you, that ye love one another" (St. John xiii. 34); to the old *mande,* a hand basket, from which food was distributed to the poor on the day before Good Friday; and to the phrase *Accipite et manducate,* "Take and eat," occurring in the Epistle for the day in the Roman Catholic church (1 Cor. xi. 24).

MAUNOURY, mō′nōō′rē′, MICHEL JOSEPH (1847–). A French soldier, born at Maintenon, Eure-et-Loir. He was educated at the Ecole Polytechnique, Paris, and served in the Franco-Prussian War of 1870 as an under lieutenant, being wounded in the battle of Champigny. He studied at the Ecole Supérieure de Guerre and in 1886–88 was an instructor in artillery at Saint-Cyr. He was regularly promoted, becoming colonel in 1897, general of brigade in 1901, and general of division in 1905. In the latter year he received command of the artillery of the forts of Paris and became president of the commission of military schools; in 1907 he was commandant of the Ecole Supérieure de Guerre; he commanded the 15th Army Corps at Marseilles in 1908 and the 20th at Nancy in 1909; and in 1910 was named military governor of Paris and a member of the Superior Council of War. At the beginning of the War in Europe (q.v.) in 1914, Maunoury was placed in command of the French reserve force near Paris, and it was his successful attack on September 6 that first checked General Von Kluck's drive towards Paris. He later commanded at Soissons, and in March, 1915, was severely wounded. He became an Officer of the Legion of Honor, and in 1915 President Poincaré conferred on him the highest French military honor, the *médaille militaire.*

MAUPASSANT, mō′pȧ′sän′, HENRI RENÉ ALBERT GUY DE (1850–93). A French novelist, one of the greatest modern writers of short stories. He was born at the Château of Miromesnil (Seine-Inférieure), Aug. 5, 1850. After serving in the Navy Department as clerk, and as soldier in the Franco-Prussian War, Maupassant was slowly initiated into the craft of story-telling by Flaubert, an old friend of Madame de Maupassant. Restraint ripened his genius, and his first story, *Boule de suif,* published in *Les soirées de Médan* in 1880, revealed a finished master of the naturalistic school. In the same year he published some striking but sensual poems, *Des vers* (1880), and a drama, *Histoire du vieux temps,* but he saw clearly that his career was elsewhere. He confirmed the promise of *Boule de suif* in about 200 tales gathered under the titles: *La maison Tellier* (1881); *Mademoiselle Fifi* (1883); *Contes de la Bécasse* (1883); *Clair de lune* (1883); *Les sœurs Rondoli* (1884); *Yvette* (1884); *Contes du jour et de la nuit* (1885); *Contes et nouvelles* (1885); *Le Horla* (1887); *La petite Roque* (1888); *La main gauche* (1889); *Le père Milon* (1899); and others, among them *L'Inutile beauté* (1890). Besides these he wrote six novels, *Une vie* (1883); *Bel-Ami* (1885); *Mont-Oriol* (1887); *Pierre et Jean* (1888); *Fort comme la mort* (1889); *Notre cœur* (1890); and several volumes of traveler's impressions, *Au soleil* (1884); *Sur l'eau* (1888); *La vie errante* (1890). *Œuvres complètes de Guy de Maupassant* (29 vols.) appeared in 1908–10, and in the latter year a good edition in English, with critical and interpretative essays, was published in New York (9 vols.). Numerous volumes of translated short stories are to be had. Traces of insanity appear at times in all the work from 1887 onward. The condition is most strongly marked in the longer novels. It caused a practical suspension of his literary work in 1890. In 1892 Maupassant became wholly insane. July 6, 1893, he died in an asylum at Passy. His whole work is a melancholy yet fascinating study in imaginative psychology. He begins as a playful satyr, yet with an aristocratic assumption of superiority to his fellow men that masked a pessimism as deep as Flaubert's. Year by year he loses the sensuous exuberance of youth, more and more he is, as it were, hypnotized by the ghastly fascinations of death, as were Villon, Gautier, and Baudelaire. The moral gloom deepens, the moral unrest grows. The robust animalism of *Une vie* becomes a melancholy moral anatomy in *Notre cœur.* In losing its sensuality it had become morbid and morally un-

certain even in *Pierre et Jean*, artistically Maupassant's best novel. The shorter stories, because requiring less sustained effort, show this less clearly. To the very end Maupassant did work of a character similar to his early work; but from *Le Horla* onward there are stories that could not be attributed to the earlier period. As a whole and in average excellence these stories are in style and art the best in France. There are stories of his native Normandy, tales of selfishness and meanness, chiefly tragic, occasionally comic, more often grim in their irony; there are stories, usually cynical, of Parisian foibles, of life in strange lands, of hunting, medical incident, of love, crime, horror, misery, all carefully elaborated and incredibly deft in the rapid portraiture of a scene or character. All is sharply individualized and the point of view is the absence of any moral law. Characteristic of Maupassant's good humor and better nature are *Le papa de Simon, Les idées du colonel, Miss Harriet, Mademoiselle Perle*, and *Clochette;* typical of his whimsical and satirical irony are *Le parapluie, Denis, Décoré, Aux bois;* bitterly satirical are *L'Héritage, La partie de campagne, Pain maudit, Maison Tellier, Hautôt père et fils*, and most exquisite of all this group, *Yvette;* more intensely misanthropic are tales of sordid brutality or wanton cruelty such as *En mer, L'Oncle Jules, Le diable, Coco, L'Ane, La fille de ferme*, or *Les sabots*, and it is to the wanton side of war that he directs attention in *La mère sauvage* and *Saint-Antoine*. Finally there are at least 40 stories that are pathologic in their pessimism. Nauseated horror of life and haunting terror of death are whispered in the stories of 1884 and recur with growing frequency and intensity, as will appear from consecutive reading of *Petit soldat, Solitude, Un fou, Lui, La petite Roque, Le Horla*, and *Qui sait*.

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MAUPEOU, mō'pōō', René Nicolas Charles Augustin de (1714–92). A French politician and Chancellor, born in Paris. Both his father and his grandfather had been President of the Parliament of France. He was made Councilor of Parliament, first President (1763), and finally succeeded his father, René Charles de Maupeou, as Chancellor of France in 1768. He presided over the famous Lally (q.v.) trial. He upheld the King in his plan to override the Parliament of Paris, and sided with Madame du Barry against the Duke of Choiseul. After the Duke's exile in 1770 he, the Duke of Aiguillon, and the Comptroller General, Abbé Terray, formed a triumvirate to suppress the power of Parliament. The Maupeou Parliament, as it was called, which was then formed, became very unpopular and Beaumarchais attacked it. Maupeou was forced to live in retirement after the death of Louis XV. In 1789 he presented the nation with a patriotic gift of 800,000 livres. He wrote an account of his high-handed disruption of the Parliament, under the title *Code des parlements ou collection d'édits . . . depuis décembre 1770, jusqu'à décembre 1771* (1772). Consult Jules Flammbermont, *Le Chancelier Maupeou* (Paris, 1883).

MAUPERTUIS, mō'pâr'twē', Pierre Louis Moreau de (1698–1759). A French mathematician and astronomer, born at Saint-Malo. His education was begun under a tutor and in 1714 he went to Paris to the College of La Marche. In 1718 he joined the army and soon attained the rank of lieutenant. Having acquired a taste for mathematics, he resigned five years later and became *adjoint géomètre* in the Academy of Sciences at Paris and in 1725 *associé*. For the next seven years he devoted himself to the investigation of certain geometric problems, publishing his results in a series of memoirs. He was one of the first Frenchmen to master the teachings of Newton. He went to England in 1728 and was admitted to the Royal Society of London. The next year he returned to Basel and studied the integral calculus with Bernoulli. In 1736 he conducted the expedition for measuring a degree of the meridian in Lapland. The results of this work confirmed Newton's theory of the flattening of the earth at the poles. It was on his return that he became acquainted with Voltaire and Samuel König. In 1740 Frederick the Great called him to Prussia, and he accompanied the King in the campaign in Silesia. Having been taken prisoner by the Austrians at Mollwitz, Maupertuis was set free by Maria Theresa and returned to Paris. He was elected a member of the French Academy in 1743, but the next year he was again called to Prussia and in 1746 became president of the Academy at Berlin. In 1750 König came there as professor of philosophy, and he and Maupertuis were soon quarreling over the question of the discovery of infinitesimal calculus and of certain laws of which Maupertuis claimed to be the author. Voltaire sided with König and satirized Maupertuis severely. Frederick interposed in behalf of Maupertuis, but to no avail. The latter, broken in health and spirit, returned to France, and in 1758 went to Basel, where he died in a short time. Some of his chief works are: *Sur la figure de la terre* (1738); *Discours sur la parallaxe de la lune* (1741); *Discours sur la figure des astres* (1742); *Lettre sur la comète de 17½2* (1742); *Astronomie nautique* (1745 and 1756); *Essai de cosmologie* (1750); *Maupertiana ou écrits divers* (Leyden, 1753). His collected works, in four volumes, were published in Paris in 1752 and again in Lyons in 1768, under the title *Œuvres complètes de M. de Maupertuis*. Consult: L. A. de la Baumelle, *Vie de Maupertuis* (Paris, 1856); J. P. Damiron, *Mémoires sur Maupertuis* (ib., 1858); id., *Mémoires pour servir à l'histoire de la philosophie du XVIIIe siècle*, vol. iii (ib., 1864).

MAUPRAT, mō'prà'. A novel by George Sand (1836). A drama in six acts was made from the story by the author and presented at the Odéon in 1853.

MAURA Y MONTANER, mou'rà ē mŏntä'nĕr, Antonio (1853–). A Spanish statesman, jurisconsult, and orator. Born in Palma of Majorca, he studied jurisprudence in the University of Madrid and became a member of the

Academia Matritense de Jurisprudencia y Legislación. As early as 1881 he was sent to Congress by his native city, which he continued to represent up to 1890, serving in 1885 as president of the Council of Ministers. After 1892 he represented Palma in the Cortes, serving as Minister of the Colonies 1892–93 (during which period he published a decree granting larger electoral and representative rights to the Antilles) and Minister of Justice in 1894. A fusionist with liberal tendencies up to 1899, he then turned conservative. On the fall of Silvela he became leader of the Conservatives, and was president of the Council of Ministers 1903 to 1904. During his term of office he accompanied the King on a tour through Cataluña and was stabbed by an anarchist in Barcelona. While he was again Prime Minister (from early in 1907 to late in 1909) occurred two cases of the utmost importance to Spain—the case of Francisco Ferrer and the Rif problem, accompanied by the rebellion in Barcelona. Maura y Montaner became director of the Royal Spanish Academy of the Language and a member of the Royal Academies of Fine Arts (San Fernando) and Moral and Political Sciences. Consult Antón del Olmet and García Carraffa, *Los grandes Españoles*, vol. iii; *Maura* (Madrid, 1913).

MAUREL, mō′rĕl′, VICTOR (1848–). A French barytone singer, born in Marseilles. He was a pupil of the Marseilles and Paris conservatories and made his first appearance at the Opera House in Paris. Afterward he went to Italy and sang at the Scala in Milan. A tour through Europe and in America followed, and in 1879 he returned to Paris. In another visit to Paris after this date he attempted to revive Italian opera in company with the brothers Corti, but without success. His fine voice and talent as an actor caused him to be chosen by Verdi to create the rôles of Iago in *Otello* and Falstaff in *Falstaff*. In 1885 he began an extended tour, appearing in Italy, North and South America, and in 1893 and 1894 sang Verdi's famous rôles in Paris at the express desire of the composer. In 1898 he appeared at the Berlin Opera House. His best-known writings are *L'Art du chant, Le chant renové par la science*, and *Dix ans de carrière*.

MAURENBRECHER, mou′rĕn-brĕK-ĕr, BERTHOLD (1868–). A German classical scholar, born at Dorpat. From 1878 to 1887 he studied at the Gymnasium at Bonn and at the Thomasschule in Berlin and in 1887–91 at the universities of Bonn and Leipzig. From 1891 to 1894 he was an assistant in the library of the University of Leipzig; from 1894 to 1906 privat-docent at Halle. Thereafter he resided at Munich, engaged on the great *Thesaurus Linguæ Latinæ*. (See DICTIONARY, *History*.) His writings include: *Sallusti Crispi Historiarum Reliquiæ* (2 vols., 1891–93); *Carminum Saliorum Reliquiæ* (1894); *Forschungen zur lateinischen Sprachgeschichte und Metrik*, i (1899); *Jahresbericht über Sallustius*, i, ii (1900, 1902); *Grundzüge der klassischen Philologie*, i, ii, iii (1908–12). The last-named work is the third edition of W. Freund's well-known *Triennium Philologicum*.

MAURENBRECHER, WILHELM (1838–92). A German historian, born in Bonn. He studied there, in Berlin, and in Munich, his great teachers being Ranke and Von Sybel, with whom he was associated on his *Historische Zeitschrift*. At Bonn he became docent in 1862. He spent a year at Simancas, Spain, in historical research, and after his return to Germany was appointed professor at Dorpat (1867), at Königsberg (1869), at Bonn (1877), and at Leipzig (1884). From 1881 to 1892 he edited the *Historisches Taschenbuch*. He wrote *England im Reformationszeitalter* (1866); *Studien und Skizzen zur Geschichte der Reformationszeit* (1874); *Die katholische Reformation* (1880); *Geschichte der deutschen Königswahlen vom 10. bis 13. Jahrhundert* (1889); *Gründung des deutschen Reiches 1859–1871* (1892). Consult Wolf, *W. Maurenbrecher: ein Lebens- und Schaffensbild* (Berlin, 1893), and *Allgemeine deutsche Biographie*, vol. lii (Leipzig, 1912).

MAUREPAS, mō′re-pä′, JEAN FRÉDÉRIC PHÉLIPPEAUX, COUNT (1701–81). Minister of State in the reigns of Louis XV and Louis XVI of France. He was born at Versailles. The office of Minister of State had been held by his father, who on resigning in 1715 transferred it to his 14-year-old son. It was administered during his minority by the Marquis de Villière, his future father-in-law. Maurepas became Minister of Marine in 1725 and Secretary of State in 1738. He made some attempts towards restoring the efficiency of the navy by establishing naval academies and introducing scientific methods of instruction. A satirical couplet against Madame de Pompadour brought about his disgrace in 1749, and he was exiled from court until the death of Louis XV. When Louis XVI came to the throne in 1774 Maurepas was recalled and became his Prime Minister. Without striking ability of his own, he displayed great wisdom in the selection of the members of his council, Vergennes being made Minister for Foreign Affairs, Turgot Comptroller General, and Malesherbes Minister of the Royal Household. He supported Vergennes in the alliance with the United States and in the declaration of war against England. He belonged in spirit nevertheless to the old régime, and in alarm at Turgot's wide-reaching plans of reform he helped to bring about that minister's downfall in 1776, whose place was taken by Necker, who in turn was dismissed in May, 1781. Maurepas held his place as chief minister of the crown until his death, which took place at Versailles, Nov. 21, 1781. Memoirs of a curious nature were published under his name (4 vols., Paris, 1790–92), but were really largely the work of his secretary. The *Bibliothèque Nationale*, however, contains a voluminous collection of French *chansons* made by him. Consult J. L. G. Soulavie, *Mémoires* (3d ed., Paris, 1792).

MAURER, mou′rĕr, GEORG LUDWIG VON (1790–1872). A German statesman and jurist, born near Dürkheim in Bavaria. He was educated at Heidelberg and Paris. In 1824 his *Geschichte des altgermanischen Gerichtsverfahrens* was crowned by the Academy of Munich, and he was appointed professor of jurisprudence in the university (1826). From 1832 to 1834, during the minority of King Otho of Greece, he was a member of the Council of Regency, his energy and ability accomplishing a complete reorganization of civil procedure. In 1847 he was Bavarian Minister of Foreign Affairs and Justice. The most valuable of his various works on history and jurisprudence are: *Das griechische Volk . . . vor und nach dem Freiheitskampfe bis zum 31. Juli 1834* (1835–36); *Geschichte der Dorfverfassung in Deutschland* (1865–66); *Geschichte der Städteverfassung in Deutschland* (1869–71).

MAURER, Konrad von (1823–1902). A German jurist, son of Georg Ludwig von Maurer. He was born at Frankenthal, Bavaria; studied at Munich, Leipzig, and Berlin; and in 1847 was appointed extraordinary professor, and in 1855 professor, of northern jurisprudence at Munich. He made an especial study of Icelandic language, literature, and history. In connection with these subjects he published: *Die Entstehung des isländischen Staates und seiner Verfassung* (1852); *Die Bekehrung des norwegischen Stammes zum Christentum* (2 vols., 1855–56); *Island von seiner ersten Entdeckung bis zum Untergang des Freistaats* (1874); *Zur politischen Geschichte Islands* (1880); *Nogle bemærkninger til Norges kirkenhistorie* (Christiania, 1893). He also edited *Gull-Thóris-Saga* (1858) and a collection of legends entitled *Isländische Volkssagen der Gegenwart* (1860). A catalogue of his library (2 vols.) was published at Munich the year following his death. For a more complete biography and critical estimate of his work, consult his obituary by Golther in the *Zeitschrift für deutsche Philologie*, vol. xxxv (Halle, 1903).

MAU'RETA'NIA, or Mau'rita'nia (Lat., Gk. Μαυρουσία, *Maurousia*, from μαῦρος, *mauros*, black). The ancient name of the most northwestern part of Africa (Map: Rome, B 3). It was so called from the Mauri or Maurusii, a general designation for its numerous tribes. At the time of its greatest expansion it included the present Morocco and more than two-thirds of Algeria, extending from the Atlantic to the Ampsaga River (Wady el Kebir). Among the kings of Mauretania were Bocchus I, the father-in-law of Jugurtha, Bocchus II, who espoused the cause of Cæsar against the Pompeians, for which his territory was considerably enlarged, and Juba II, the son of the Pompeian partisan Juba I of Numidia. Under the Emperor Claudius it was made a Roman province and divided into Mauretania Cæsarensis and Mauretania Tingitana, separated by the Mulucha (Muluya) River. The country was noted for its extraordinary fertility, and its upland plains, stretching from the Atlas Mountains to the sea, supplied Italy with grain. From the hands of the Romans it passed in succession to the Vandals, the Byzantines, and the Arabs. Consult *Cambridge Mediæval History*, vol. ii (New York, 1913). See Barbary States.

On Oct. 18, 1904, the Civil Territory of Mauretania (Fr. *Mauritanie*) was organized as a part of the Government General of French West Africa. This territory extends from the French colony of Senegal (separated therefrom by the Senegal River) along the Atlantic to the Spanish colony of Río de Oro; thence it stretches northeastward, in which direction its boundary is not definitely determined; eastward of its southern part lies the French colony of Upper Senegal and Niger. Mauretania comprises a large part of the western Sahara and embraces the mountainous regions of Tagant and Adrar (the latter not to be confused with the region known as Adrar in the Military Territory of the Niger). For the most part Mauretania is a low-lying country of sandy plains or dunes, with no permanent streams. As the northeast boundary is not fixed, the area can be estimated only arbitrarily. This is stated at 893,700 square kilometers (about 345,000 square miles). The number of inhabitants is unknown, and estimates appearing in contemporary official publications vary greatly; e.g., the French *Annuaire statistique*, published in 1913, places the population at 225,000, whereas *Annuaires* of the Government General of French West Africa, published both before and after that date, place it at about 600,000. In the south a strip of country from 6 to 25 miles broad bordering the Senegal River is rendered fertile by numerous pools, and here some cultivation, especially of millet, is carried on by the negro inhabitants. These people are of the same races as those in Senegal—Yolofs, Peuhls, Toucouleurs, Sarakolés, who dwell in villages along the river. The bulk of the population is Moorish, being a mixture of Arabs and Berbers. With the exception of palm-tending groups, the Moors of Mauretania are mostly nomads, engaged principally in grazing. They are all Mohammedans, many of them Sufistic. The principal towns or villages include Port-Etienne, Boutilimit, Aleg, Moudjeria, Kaedi, Atar, Selibaby, Tidjikdja, etc. Trade, carried on by caravan, is largely in the nature of barter. Mauretania is administered by a commissioner, resident at Saint-Louis in Senegal. Pillaging bands are not uncommon in the territory, and there have been numerous minor uprisings.

MAURI. See Mauretania; Moors.

MAURICE, mą'rĭs (Flavius Tiberius Mauricius) (c.539–602). Byzantine Emperor from 582 to 602. He was descended from an ancient Roman family. During the reigns of Justin II and Tiberius II Maurice was in the military service and in 578 was appointed by the latter Emperor to the command of the army sent against the Persians. In 582 he obtained the rare honor of a triumph at Constantinople, became the son-in-law of Tiberius II, and in August of the same year succeeded him on the throne. Immediately after his accession the Persians invaded the Byzantine territories; a fierce contest of nine years' duration ensued, which, chiefly owing to the internal convulsions that distracted Persia, resulted in favor of the Byzantines. The King of Persia, Khosru II (q.v.), driven from his throne, fled to the Byzantines; an army was immediately assembled, and in 591 Khosru was restored to his throne, giving up to Maurice the fortresses of Daras, Martyropolis, and Persarmenia. In 599 the Avars demanded ransom money for 12,000 soldiers whom they held as prisoners. The Emperor refused to ransom them and they were consequently put to death. This excited a deep resentment in the army, and in 602, when the Emperor ordered his troops to take up their winter quarters on the north side of the Danube, they broke out into open revolt, proclaimed Phocas Emperor, and marched upon Constantinople. Maurice with all his family and many of his friends was put to death on Nov. 27, 602. Consult J. B. Bury, *Later Roman Empire* (New York, 1899), and Edward Gibbon, *Decline and Fall of the Roman Empire*, edited by J. B. Bury (London, 1912).

MAURICE, Prince of Orange and Count of Nassau, commonly styled Maurice of Nassau (1567–1625). Stadholder of the Netherlands, and one of the distinguished generals of his age. He was the son of William the Silent, founder of the Dutch Republic, and was born at Dillenburg in Nassau in 1567. After the assassination of his father in 1584 the provinces of Holland and Zealand, and later Utrecht, elected him their stadholder (1590). He was also President of the Council of State. A great portion of the Netherlands was still in the hands

of the Spaniards; and though during the first part of his administration he was unsuccessful, later Maurice rapidly wrested cities and fortresses from the enemy. In 1591 Zutphen, Deventer, Nimeguen, and other places fell into the hands of the Dutch; in 1593 Gertruydenberg and in 1594 the Province of Groningen. In 1597, with the help of some English auxiliaries, Maurice defeated the Spaniards at Turnhout in Brabant and in 1600 won a splendid victory at Nieuwport. In 1604, however, Ostend, after a siege of three years, surrendered to the Spaniards. Finally in 1609 Spain agreed to a truce of 12 years, which meant the practical achievement of their independence by the Dutch. In 1621 the struggle was renewed. Maurice from political motives was the bitter enemy of Barneveldt (q.v.), whose death he caused. This is the only stain on his memory. Consult: G. Groen van Prinsterer, *Maurice et Barneveldt* (Utrecht, 1875); M. O. M. Nutting, *The Days of Prince Maurice* (Boston, 1894); J. L. Motley, *Life and Death of John of Barneveldt* (2 vols., New York, 1902).

MAURICE, Duke and Elector of Saxony (1521–53). He was the eldest son of Duke Henry the Pious of the Albertine line. He was born at Freiburg, March 21, 1521, married in 1541 Agnes, daughter of the Landgrave Philip of Hesse, and later in the same year succeeded his father in the Duchy of Saxony. He was early involved in disputes with his cousin, the Elector John Frederick of the Ernestine line. Though a Protestant, he did not join the Schmalkalden League (q.v.), and was finally won over by the Emperor Charles V, who, preparing to crush German Protestantism by force of arms, promised him (June 19, 1546) the possessions of the Ernestine line and the electoral dignity as soon as John Frederick, who was one of the leaders of the League, should be dispossessed. He invaded electoral Saxony (1546), but was driven from it and from his own domains, and only saved by the timely assistance of the Emperor and the Duke of Alva, who at the battle of Mühlberg (1547) annihilated the army of the Schmalkalden League and took John Frederick prisoner. Maurice now became ruler of the whole of Saxony, with the electoral dignity. The imprisonment of Philip of Hesse, whom Maurice had prevailed upon to submit to the Emperor, was the first cause of estrangement between Charles and Maurice. The attempts of the Emperor to increase his own preponderance supplied another; a further source of trouble was the refusal of the Emperor to hand over to Maurice the episcopal territories of Magdeburg and Halberstadt, the prospect of whose possession had been held out to him; in addition Maurice was alarmed for the safety of Protestantism. The new Elector gradually came to see that his close alliance with the Emperor was alienating from him the affections of his Protestant subjects. He accordingly abandoned the cause of the Emperor with as little scruple as he had formerly sacrificed the interests of his relatives and coreligionists, and arranged an alliance against Charles V, comprising a number of German princes and Henry II of France, to whom the bishoprics of Metz, Toul, and Verdun were promised as a reward for his assistance. In March, 1552, Maurice suddenly appeared with an army in south Germany and compelled the Emperor, who was then at Innsbruck, to take refuge in flight, leaving to his brother Ferdinand the conduct of negotiations. Finally, at a convocation of the electors and princes of the Empire at Passau, the terms of a treaty of peace were arranged, in which it was agreed that the Lutheran states should be free to maintain their mode of worship. In the summer of 1553 Maurice took the field against Albert, Margrave of Brandenburg-Culmbach, who had refused to accede to the terms of the Treaty of Passau and was raiding the Rhine bishoprics and Franconia. He was fatally wounded in the battle at Sievershausen, July 9, dying July 11. Although but 32 years of age, he had established his reputation as one of the ablest diplomats, administrators, and generals of his time; but he united with a most agreeable personality a dissimulation and bad faith which lost him the confidence of both parties.

Consult: F. A. von Langenn, *Moritz, Herzog und Churfürst zu Sachsen* (Leipzig, 1841); Prutz, "Moritz von Sachsen," in *Der neue Plutarch*, vol. ix (ib., 1882); S. Issleib, "Moritz von Sachsen als protestantischer Fürst," a short study in *Sammlung gemeinverständlicher wissenschaftlicher Vorträge* (Hamburg, 1898); *Cambridge Modern History*, vol. ii (Cambridge, 1904), containing a bibliography. His *Politische Korrespondenz* was published by E. Brandenburg (Leipzig, 1900-04). See REFORMATION; SAXONY.

MAURICE, mą'rĭs, ARTHUR BARTLETT (1873–). An American editor, born at Rahway, N. J., and educated in Paris, at Richmond College (Va.), and at Princeton. He served as an editor of the Woodbridge (N. J.) *Register* in 1895, as city editor of the Elizabeth (N. J.) *Daily Herald* in 1896, and as special writer for the New York *Commercial Advertiser* in 1897–98. Of the *Bookman* he was joint editor from 1899 to 1909 and editor thereafter. He contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA and is author of *New York in Fiction* (1901) and *History of the Nineteenth Century in Caricature* (1904), with F. T. Cooper.

MAURICE, (JOHN) FREDERICK DENISON (1805–72). An English author and divine, born at Normandston, the son of a Unitarian clergyman. He studied at Cambridge and became engaged in literary work in London. Influenced by Coleridge and others, he decided to become a clergyman in the Established church. He went to Oxford and took his M.A. degree and was ordained in 1831. His first position was the curacy of Buddenhall. In 1836 he became chaplain of Guy's Hospital, London; in 1840 professor of history and English literature at King's College and in 1846 of divinity in this school, losing these last positions in 1853 because of his supposedly radical religious views. He was chaplain of Lincoln's Inn, 1846–60; incumbent of St. Peter's, Vere Street, London, 1860–69; professor of moral philosophy at Cambridge from 1860 until his death, which occurred in London, April 1, 1872. At the time of his death there was probably no clergyman in England more deeply revered and loved by the people, and within the Church he had become the head of the Broad Church party and had a large following among the younger men. He founded the Working Men's College in London in 1854 and became its principal. He wrote one novel, *Eustace Conway* (1834). Other works are: *The Kingdom of Christ* (1838); *Religions of the World* (1847); *Moral and Metaphysical Philosophy* (1850–57); *Prophets and Kings of the Old*

Testament (1853); *Unity of the New Testament* (1854); *Ecclesiastical History of the First and Second Centuries* (1854); *Patriarchs and Lawgivers of the Old Testament* (1855); *Epistle of St. John* (1857); *The Word Eternal* (1863); *Conscience* (1868); *Social Morality* (1869). Consult: Sir J. Frederick Maurice, *Life of F. D. Maurice, chiefly Told in his Own Letters* (2 vols., New York, 1884); C. F. G. Masterman, *Frederick Denison Maurice* (London, 1907); also R. H. Hutton, in *Essays on Some of the Modern Guides of English Thought in Matters of Faith* (New York, 1887); F. M. Brookfield, in *Cambridge Apostles* (ib., 1906).

MAURICE, Sir John Frederick (1841–1912). An English soldier, born in London. He studied at Addiscombe College and Woolwich Academy and entered the Royal Artillery in 1861. He was private secretary to Sir Garnet Wolseley in the Ashanti campaign of 1873–74; served in the Zulu War in 1880; was deputy assistant adjutant general of the Egyptian expedition in 1882; and was brevetted colonel in 1885. In 1885–92 Maurice was professor of military history at the Staff College and in 1895 he was promoted to major general. His reputation depends chiefly on his military writings, which include: *Hostilities without Declaration of War* (1883); *Popular History of Ashanti Campaign* (1874); a life of his father, Frederick Denison Maurice (1884); *The Balance of Military Power in Europe* (1888); *War* (1891); *National Defenses* (1897); *Diary of Sir John Moore* (1904); an official *History of the War in South Africa, 1899–1902* (4 vols., 1906–10).

MAURICE, Saint. See Legion, Theban.

MAURICE, Thomas (1754–1824). An English scholar and historian, born at Hertford. He was a pupil of Dr. Parr in an academy at Stanmore and afterward entered St. John's College, Oxford, but the next year removed to University College, where he graduated in 1773. Appointed curate of Woodford in Essex, he resigned in 1785 for a pastorate at Epping. In 1798 he was appointed by Earl Spencer vicar of Wormleighton in Warwickshire and in the same year was appointed keeper of manuscripts in the British Museum. In 1800 he received the pension left vacant by the death of the poet Cowper and in 1804 was presented by the Lord Chancellor to the vicarage of Cudham in Kent. A learned Orientalist, he published a voluminous work on *Indian Antiquities* (7 vols., 1793–1800). In addition he wrote *History of Hindustan* (2 vols., 1795–98) and a *Modern History of Hindustan* (1802–10). His *Memoirs*, published at London (1820–22), give a good account of the progress of Indian literature in Britain during the preceding 30 years.

MAURICE OF SAXONY. A French soldier generally known as Marshal Saxe. See Saxe, Maurice, Count of.

MAURICIUS, mą-rĭsh′ĭ-ŭs, Flavius Tiberius. A Byzantine Emperor. See Maurice.

MAU′RITA′NIA. See Mauretania.

MAURITIA, mą-rĭsh′ĭ-ȧ (Neo-Lat., so called in honor of Prince Maurice of Nassau). A genus of palms, all natives of the hottest parts of America. Some of them, like *Mauritia vinifera*, the wine or buriti palm (q.v.), have lofty columnar smooth stems; others are slender and armed with strong conical spines. The miriti palm (*Mauritia flexuosa*) grows to the height of 100 feet, or even 150 feet in river deltas; it has very large leaves on long stalks. The stem and leafstalks are utilized for various purposes. The fibre from the young leaves is extensively used for cordage and in the manufacture of hammocks. Sago is obtained from the stems. A beverage is made from the fruit, as from that of the buriti palm and several other species.

MAURITIUS, mą-rĭsh′ĭ-ŭs (named in honor of Maurice of Nassau), formerly Ile de France. A British island in the Indian Ocean, 550 miles east of Madagascar, between long. 57° and 58° E. and lat. 19° and 20° S. (Map: Africa, K 7). Its area is 720 square miles. The coasts are low, except at three points where the mountains reach them. The surface rises in the interior to a plateau, surmounted by three groups of mountains with other outlying elevations. Extinct craters testify to the volcanic origin of the island, which, however, is fringed with coral reefs. The highest peaks are Pitou de la Rivière Noire (2711 feet) and Ponce (2650 feet). The coasts, although well indented, are difficult of access on account of the numerous coral reefs by which they are surrounded. The only good harbor is Port Louis, on the northwest coast, which is sheltered by coral reefs. The rivers are short and unfit for navigation. The climate is considerably tempered by the mountainous character of the island. There is about 10° difference between the temperature in the interior and that of the coast regions. The mean annual temperature at Port Louis, the capital and largest town, is about 79° F. The rainfall varies from 145 inches per year in the southeast to 31 in the west. The island has suffered considerably from hurricanes and fever epidemics. The present flora is almost entirely foreign, although some of the plants were introduced so long ago that they have come to be considered indigenous. The fauna of Mauritius, never very extensive, has been still more impoverished by the total destruction of the once magnificent forests, which have been replaced with plantations. Most of the domestic animals are of foreign origin. Among the extinct species may be mentioned the dodo (q.v.) and several other birds whose inability to fly was the cause of their early extermination. Mauritius has a fertile although somewhat stony soil, adapted for the cultivation of the chief tropical products. Cane sugar has been the staple of the island for a very long period, and it is mainly by the sugar crop that the economic condition of the island is determined. Formerly nearly all the export sugar went to Europe, but this outlet has been largely closed in recent years by the competition of European beet sugar. If the British East Indian markets had not been opened in the last decade of the nineteenth century, the sugar industry would have been ruined. Other products of minor importance are cereals, cotton, pepper, indigo, coconuts, vanilla, drugs, and tea. The commerce of Mauritius is chiefly with the United Kingdom and the British colonies. In 1902 imports were valued at Rs.31,143,520 (rupee=32.444 cents), of which Rs.8,218,420 from the United Kingdom; in 1912, Rs.32,266,707, of which Rs.11,569,227 from the United Kingdom. Exports in 1902 and 1912 respectively were valued at Rs.36,389,130 and Rs.37,184,189, of which Rs.4,365,350 and Rs.4,466,656 to the United Kingdom. The imports are mainly grain (rice, wheat, etc.), cotton goods, wine, coal, hardware, and manure. Ordinarily about nine-tenths of the export value represents sugar; the sugar export in 1912 amounted to

206,677 metric tons, with estimated value of Rs.34,900,000. The value of the aloe-fibre export in 1912 was Rs.681,978. Minor exports are molasses, rum, coconut oil, and vanilla. Port Louis is connected by steamship lines with Marseilles (France) and Colombo (Ceylon), as well as with England via the Cape of Good Hope. There is frequent communication by both sail and steamer with Madagascar, Natal, Réunion, India, Australia, etc.; most vessels plying between Europe and India via the Cape of Good Hope touch at Port Louis. Mauritius has 130 miles of railway comprised in seven lines, all owned and operated by the government.

Under the constitution as amended in 1884–85 the colony is administered by a Governor assisted by an executive council of 4 ex-officio members. There is a legislative council of 27 members, 8 being ex-officio, 9 nominated by the Governor, and 10 elected. The right of suffrage is contingent on certain property qualifications. The law is based on the Code Napoléon and other French laws modified by colonial ordinances.

The estimated population of Mauritius in 1767 was 19,000, and in 1837, 134,000; the census of 1881 returned 359,874; 1891, 370,588; 1901, 380,040; 1911, 377,083. Of the total in 1911, 370,393 were returned for the island of Mauritius and 6690 for the dependencies. Of the 370,393, the number of persons of European, African, or mixed descent was 108,844; Indo-Mauritians, i.e., persons of East Indian descent born in Mauritius, 222,361; other Indians, 35,526 (it is probable that a number of old Indian immigrants returned themselves as Indo-Mauritians); Chinese, 3662. The military, included in the total 377,083, numbered 1602. Indians and persons of Indian descent constituted about 70 per cent of the population. The Indian population dates from the emancipation of the slaves (about 66,000) in 1834–39. As many of the freed slaves were unwilling to work on the estates of their former masters, the latter invited immigration from India, which, except for occasional temporary stoppages, continued until 1910. The Indo-Mauritians are now predominant in commerce and agriculture, and the amount of land held by them as small planters is increasing. The white population is largely French. In 1911 Roman Catholics numbered about 122,000 and Protestants about 7000. In recent years a great part of Port Louis, the capital, has passed from European to Indian or Chinese ownership, and the population of the city has somewhat declined; in 1911 it had, with suburbs, 50,060 inhabitants. (See PORT LOUIS.) The second largest town is Curepipe, with 17,173 inhabitants in 1911; Mahebourg had 3505. Primary education is free, but not compulsory. In 1912 primary education was provided in 60 government schools, with 9522 pupils (average attendance, 5775), and 89 aided schools, with 11,987 pupils (7635). Relative numbers of the pupils according to religion were: Roman Catholics, 62.06 per cent; Anglicans, 2.32; other Christians, 0.98; Mohammedans, 10.59; Hindus and others, 24.05. The Royal College provides secondary instruction.

The dependencies of Mauritius include various small islands in the Indian Ocean. Of these, the most important is Rodrigues, in lat. 19° 44′ S. and long. 63° 34′ E., 344 nautical miles from Mauritius. It has an area of 42 square miles and a population (1911) of 4829. Diego García (pop., 517) is the most important of the Oil Islands group. Other dependencies are the Cargados Islands, Chagos Islands, and Eagle Islands.

Mauritius was discovered by the Portuguese in 1505 and remained in their possession until 1598, when it was ceded to the Dutch, who gave it its present name. Aside from erecting a fort at Grand Port, one of the smaller trading ports, the Dutch did no more for the settlement of the island than their predecessors and finally abandoned it in 1710. The island was soon taken over by the French and under their rule began to develop, especially during the second half of the eighteenth century. During the war between France and England at the beginning of the nineteenth century the island was captured by England and was formally ceded by France in 1814.

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MAURITIUS AND LAZARUS, ORDER OF. An Italian order of merit with five classes, originally an ecclesiastical order founded by Amadeus VIII of Savoy in 1434. It was suppressed in 1802, restored by Victor Emmanuel of Sardinia in 1816, and reconstituted by Victor Emmanuel II in 1868.

MAUROCORDATOS. See MAVROCORDATOS.

MAUROMICHALIS, mäv′rą-mē-kä′lēs. See MAVROMICHALIS.

MAURRAS, mō′rä′, CHARLES MARIE PHOTIUS (1868–). A French critic and journalist, born at Martigues and educated at the Collège Catholique of Aix. He founded with Moréas (q.v.) the Ecole Romane Française. A leader in the fight against romanticism, in the reaction towards a neoclassical tradition, he contributed to numerous reviews and from 1894 to 1900 was literary critic for the Larousse Encyclopædia. He wrote: *Jean Moréas* (1891); *Le chemin de paradis* (1895); *L'Idée de la décentralisation* (1898); *Trois idées politiques: Chateaubriand, Michelet, Sainte-Beuve* (1898); *Les amants de Venise: George Sand et Musset* (1902); *Jules Lemaître et son ami* (1903), with Boncour; *L'Avenir de l'intelligence* (1905); *Le dilemme de Marc Sanguier: essai sur la démocratie religieuse* (1906); *Kiel et Tanger* (1910); *La politique religieuse* (1912); *Enquête sur la monarchie* (1913).

MAU′RUS, RABANUS. A German theologian. See RABANUS MAURUS.

MAURUS, mą′rŭs, SAINT (?494–584). He was born in Rome about 494. He was of a noble family and was placed by his father, Equitius, under the tutelage of St. Benedict, who sent him to Gaul. Here he founded the monastery of Glanfeuil, or Saint-Maur-sur-Loire, in 543, over which he presided for 40 years. He died in 584, and his day is January 15. The Congregation of Saint-Maur has done

a great work in reforming the monastic orders and in ecclesiastic literature.

MAURUS, Terentianus. See Terentianus Maurus.

MAURU'SII. See Mauretania.

MAURY, mą'rē, Dabney Herndon (1822–1900). An American soldier and author, born at Fredericksburg, Va. He graduated at the University of Virginia in 1841, studied law, and afterward went to West Point, where he graduated in 1846. He served in the Mexican War and was brevetted first lieutenant for gallantry at Cerro Gordo. From 1847 to 1850 he was assistant professor of geography and ethics, and from 1850 to 1852 of infantry tactics at West Point. He then served in the West and was superintendent of cavalry instruction at Carlisle Barracks in 1858. While serving as assistant adjutant general in New Mexico in 1861 he was discharged from the army and entered the Confederate service as colonel. After the battle of Pea Ridge he was promoted brigadier general and opposed Grant during the Van Dorn raid. He also met Sherman successfully in the latter's attack on Vicksburg in 1862. Later he was promoted major general and was placed in command of the Department of Tennessee. At the end of the war he was in command of the Department of the Gulf and surrendered on May 24, 1865. In 1868 he organized the Southern Historical Society. From 1886 to 1889 he served as United States Minister to Colombia. His writings include: *Skirmish Drill for Mounted Troops* (1859); *Recollections of a Virginian in the Mexican, Indian, and Civil Wars* (1894); *Young People's History of Virginia and Virginians* (1904).

MAURY, mō'rē', Jean Siffrein (1746–1817). A French prelate, the son of a shoemaker, born at Valréas in the Department of Vaucluse, France. He studied for the priesthood at Avignon and went to Paris at the age of 20 as *abbé précepteur*. He soon made himself known as an eloquent panegyrist, became a favorite preacher at the court, and was appointed to the abbey of Frénade. He was elected also to a seat in the French Academy (1785). In 1789 he was chosen deputy of the clergy to the States-General, where he was prominent in defense of the church and royalty, and with great vigor, skill, and eloquence opposed the revolutionary measures until the flight of Louis XVI. At the dissolution of the Constituent Assembly he left France in 1792, and at the invitation of Pius VI took up his residence in Rome, where he was received with great honor. In 1794 he was made Archbishop of Nicæa *in partibus*, extra nuncio to the Diet at Frankfort, Cardinal, and Bishop of Montefiascone. On the invasion of Italy by the French in 1798 he fled in disguise to Venice and thence to St. Petersburg. Returning in 1799, he was appointed by the Count of Provence, afterward Louis XVIII, his Ambassador to the holy see. Becoming reconciled to Napoleon, he returned to France in 1806. In 1810 he was appointed Archbishop of Paris, and his refusal to abdicate this office at the command of Pius VII cost him six months' imprisonment at Rome after the Restoration. Maury published a treatise entitled *Essai sur l'éloquence de la chaire* (1810).

MAURY, mou'rē, Juan María (1772–1845). A Spanish poet, born at Malaga. He studied abroad, both in France and England, and on his return to Spain took part in the War of the French Occupation. He was a supporter of Joseph Bonaparte, and was afterward exiled and died in Paris. His works include: *La agresión británica* (1806), *L'Espagne poétique* (1826–27), *Esvero y Almedora* (1840), a poem in twelve cantos.

MAURY, mō'rē', Louis Ferdinand Alfred (1817–92). A French scholar and archæologist, born at Meaux, Seine-et-Marne. In 1860 he was made librarian at the Tuileries. He was appointed professor of history and morality at the College of France in 1862 and was general director of the archives from 1868 until 1888, when he retired. He assisted Napoleon III in his *Histoire de Jules César* and himself published: *Essai sur les légendes pieuses du moyen âge* (1843); *Les fées du moyen âge, recherches sur leur origine* (1843); *Histoire des religions de la Grèce antique* (1857–59); *Croyances et légendes de l'antiquité* (1863); *Les forêts de la Gaule et de l'ancienne France* (1867); *Exposé des progrès de l'archéologie* (1867); *La terre et l'homme* (1869).

MAU'RY, Matthew Fontaine (1806–73). An American naval officer and hydrographer, born in Spottsylvania Co., Va. He studied at Harpeth Academy in Tennessee until 1825, when he was appointed midshipman in the navy. The next year he was an officer on the *Vincennes* during her voyage around the world. Crippled for the rest of his life by fracturing his leg in 1839, he was appointed to the Naval Observatory and Hydrographic Office in Washington. There he made a study of old ships' logs, the result of which was a series of *Wind and Current Charts* that were of incalculable benefit to navigators. There also he prepared his *Physical Geography of the Sea and its Meteorology* (1855). In 1853 he was promoted to the rank of commander. At the outbreak of the Civil War he offered his services to the Confederacy, and was sent (1862) on a mission to Europe, where he remained until the conclusion of peace. He then went to Mexico and was appointed commissioner of emigration by Emperor Maximilian. Upon the overthrow of the Imperial régime Maury returned to the United States and became professor of physics at Virginia Military Institute. Among his publications not previously mentioned are *Letters on the Amazon and the Atlantic Slopes of South America* (1853) and *Lanes for Steamers Crossing the Atlantic* (1854). Consult Corbin, *Life of Matthew Fontaine Maury* (London, 1888).

MAUSER, mou'zēr. The name of two German inventors. Peter Paul (1838–1914) and his brother Wilhelm (1834–82) were both born at Oberndorf, Württemberg, and both secured employment in the arsenal of their native town. The two brothers produced in 1863 a needle gun, which they improved in 1865. In 1867 they went to Liége, where they perfected, with the financial help of the American Norris, the breech-loading gun. Returning in 1869 to Oberndorf, they placed their invention before the Prussian government, which acquired the model in 1871, the "Mauser model 1871." To be able materially to profit by their invention they bought in 1874 the arsenal at Oberndorf, which later was changed into a stock company and taken up in 1897 by the Deutsche Waffen und Munitionsfabriken. After 1874 they invented a pistol and (1879) a revolver and repeating rifle. Soon they were in a position to fill government contracts for rifles, supplying Servia, Turkey, Belgium, Spain, Portugal,

Sweden, Mexico, and several South American republics. Peter Paul Mauser is principally known for his invention of the Mauser magazine rifle (1897), which was adopted by the German and other armies, and for a magazine pistol. See SMALL ARMS.

MAUSER GUN. See MAUSER; SMALL ARMS.

MAU'SOLE'UM (Lat., from Gk. μαυσωλεῖον, *mausōleion*, from Μαύσωλος, *Mausōlos*). A sepulchral monument of large size, containing a chamber in which urns or coffins are deposited. The name is derived from the tomb erected at Halicarnassus to Mausolus, King of Caria, by his widow, Artemisia. (See ARTEMISIA, 2.) The work is said to have been begun by Mausolus (353 B.C.), and to have been completed by the artists after the death of Artemisia (c.350 B.C.). It was one of the most magnificent monuments of the kind and was esteemed one of the seven wonders of the world. The architects were Satyrus and Pythus or Pythis, and it is said that Scopas, Bryaxis, Timotheus (or, according to Vitruvius, Praxiteles), and Leochares were employed on the sculpture. It was described by Pliny and is mentioned by mediæval writers, as late as the twelfth century, in a manner that seems to imply that it was still uninjured. The upper part was overthrown, probably by an earthquake, in the course of the next two centuries; for, when the Knights of St. John of Jerusalem, in 1402, took possession of the site of Halicarnassus, they used the ruins as a quarry in building their castle. The interior was still undisturbed, for in 1522, when repairing the castle and excavating among the ruins for building materials, the knights discovered a large chamber decorated with colored marbles, reliefs and columns. These were all destroyed to furnish lime. An inner chamber contained a white marble sarcophagus. Fragments of the frieze were used to decorate the castle walls, and in 1846 these were obtained by Sir Stratford Canning for the British Museum. In 1856–58 excavations conducted for the British government by Charles Thomas Newton (q.v.) led to the discovery of the lost site and the recovery of many fragments of architecture and sculpture. (See BUDRUN.) The foundations and fragments, combined with Pliny's rather inadequate notice, have led to at least 50 attempts to reconstruct the monument, but without any very conclusive result. The Mausoleum consisted, apparently, of a lofty rectangular base or podium, about 230 by 250 feet, on which stood a chamber surrounded by an Ionic colonnade (the *pteron*) of 36 columns; this seems to have been surmounted by a pyramid of 24 steps, on the truncated apex of which was a marble four-horse chariot. Whether the colossal statues of Mausolus and Artemisia were placed in the chariot or elsewhere in the building is a matter of dispute. The reliefs belong to three friezes and represent a battle of the Greeks and the Amazons, the contest between the Centaurs and Lapithæ, and a chariot race. Their exact position in the building is uncertain, though the first is probably the frieze of the external Ionic order. In addition to the histories of Greek sculpture, consult: Newton, *History of Discoveries at Halicarnassus, Cnidus, and Branchidæ* (London, 1862–63); id., *Travels and Discoveries in the Levant* (ib., 1865); Oldfield, in *Archæologia*, vols. liv, lv (ib., 1895–96); Adler, *Das Mausoleum zu Halikarnas* (Berlin, 1900); A. H. Smith, *Catalogue of Sculptures in the British Museum*, vol. ii (London, 1900), where the fragments are described and sketches of the proposed restorations are given; K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., Leipzig, 1914).

By extension the term is used to designate any monumental sepulchral edifice, whether ancient or modern. Among the most important tomb structures of this sort the following may be mentioned. (1) The mausoleum of Augustus in the Campus Martius at Rome, a circular stone edifice nearly 300 feet in diameter, still partly extant. Its massive vaults were probably once covered by a mound of earth planted with trees. (2) Of Hadrian, now the Castel Sant' Angelo, on the right bank of the Tiber, also a vast circular structure, once richly adorned with statues and surmounted by a conical roof of stone. (3) Of Theodoric, at Ravenna, a stone structure externally circular, in two stories; only 30 feet in diameter, it is remarkable for its dome, composed of a single stone 36 feet in diameter. (4) Several remarkable domed structures in India built under the Mogul emperors, of which three are especially important—the tomb of Mahmud at Bijapur, with a dome covering a chamber 137 feet in diameter; of Humayun at Delhi, of sandstone and marble; of the Shah Jehan at Agra, known as the Taj Mahal (q.v.), the most beautiful of all mausolea, built about 1650 largely of alabaster inlaid with precious and semiprecious stones. On the other hand, the mausoleum of Akbar at Secundra is an open structure in several diminishing terraces. (5) Of Napoleon I at Paris, the famed Dome of the Invalides (q.v.), built as a royal sepulchral chapel in 1675–1735, but internally remodeled in 1843–52, with an open crypt to receive the remains of the exiled Emperor. (6) Of General Grant in Riverside Park, New York City, built by popular subscription to receive the bodies of the former President and his wife, and internally modeled somewhat after that of Napoleon.

Sepulchral chapels and tomb mosques are sometimes included under this title, as the tomb mosques of Cairo and the (unfinished) sepulchral chapel of King Manoel at Belem in Portugal; but this is hardly a correct use of the term. On the other hand, the Imperial *turbeh* of the Turkish sultans at Constantinople properly belong in this category of mausolea; they are impressive structures, especially those of Solyman and of Roxelana (Khourrem) in the precincts of the Suleimaniyeh. See AUGUSTUS, MAUSOLEUM OF; GRANT, ULYSSES SIMPSON; HADRIAN, TOMB OF.

MAUSO'LUS. See MAUSOLEUM.

MAUVAISES TERRES, mō-vâz' târ'. See BAD LANDS.

MAUVE, mouv, ANTON (1838–88). A Dutch landscape and animal painter, one of the most eminent of the nineteenth century. He was born at Zaandam, but his family removed to Haarlem when he was a boy, and Mauve studied there under the cattle painter Van Os, but he was chiefly self-taught. Afterward he spent some time in Oosterbeek and later lived at The Hague and at the village of Laren. Mauve stands with Israels and the brothers Maris in the front rank of modern Dutch painters. His subjects are usually landscapes with cows, sheep, horses, or figures of peasants, and scenes on the seashore. They are simple, truthful, yet refined, and possess that fine poetic quality which modern Dutch

art has inherited from the past. In the subtle appreciation of values and in the luminous quality of his skies he has never been surpassed. He painted in oil and water color with equal ease, although his water colors are more spontaneous. Fine examples of his paintings in oil are: "Heath near Laren" and "Milking Time," both in the Rijks-Museum; "Spring" and "Autumn," two fine sheep paintings, in the Metropolitan Museum of Art, New York; and "Watering Horses" (National Gallery, London). Among his water colors two of the best known are "Interior of a Barn" and "Shepherd and Flock." Before he was generally recognized in other countries Mauve was highly esteemed in the United States, where his paintings brought high prices, and where he is well represented in private collections; e.g., by five good cattle pieces in the collection of James G. Shephard. Consult Max Rooses, *Dutch Painters of the Nineteenth Century*, vol. iii (London, 1898–1901), and Marius, *Dutch Painters of the Nineteenth Century* (ib., 1908).

MAUVEIN. See COAL-TAR COLORS.

MAV'ERICK, PETER (1780–1831). An American engraver and lithographer, born in New York City. He was the son of Peter Rushton Maverick, etcher and engraver, from whom he learned his art. He was a founder of the National Academy of Design and one of the first engravers of note in America, and conducted a flourishing business in New York. His plates, which are chiefly portraits, are deficient in technique and lifeless in expression. Among the best are: Cervantes; Oliver Ellsworth, after Trumbull; Henry Clay, after King (1822); and Andrew Jackson, after Waldo. Asher B. Durand (q.v.), the engraver, was his pupil, and his partner in 1817.

MA'VIS (OF. *mauvis, malvis,* Fr. *mauvis,* probably from Bret. *milfid, milvid, milthouid,* Corn. *melhuet, melhues,* lark). The song thrush (*Turdus musicus,* or *philomelus*) of Europe is commonly known in Scotland as the mavis, and although this name is now rather uncommon in England, where "throstle" and "redwing" are more often heard, it has passed into literature to such an extent as to be well known wherever English is spoken. (See SONG THRUSH.) In Scotland the missel thrush (q.v.) is known as big mavis.

MAVOR, JAMES (1854–). A Canadian economist. He was born at Stranraer, Scotland, and was educated at the University of Glasgow. In 1888 he was appointed professor of political economy and statistics in St. Mungo's College, Glasgow. He was also assistant editor of a technical journal, editor of the *Scottish Art Review,* and took part in university-extension work and in practical schemes for the economic betterment of workmen. He went to Canada in 1892 and was appointed professor of political economy in Toronto University. In addition to his professional duties he was intrusted by the British Board of Trade and the Canadian government, as well as by important charitable and economic organizations, with investigations of labor conditions, immigration, railway rates, copyright, grain production and transportation, and other similar subjects. In making these investigations he traveled extensively in America, Europe, and the Far East. He was special lecturer in economics in Punjab University, India, in 1914–15, and was elected a fellow of the Royal Society of Canada. His publications include: *Wage Theories and Statistics* (1888); *Economic Theory, and History Tables and Diagrams* (1890); *Economic Study, and Public and Private Charity* (1892); *Report on Labour Colonies in Germany* (1893); *English Railway Rate Question* (1894); *Handbook of Canada* (1897); *Notes on Art* (1898); *Report on Immigration into Canada from Europe* (1900); *Report on Workmen's Compensation Acts* (1900); *Papers on Municipal Affairs* (1904); *Report to British Board of Trade on the North-West of Canada* (1905); *Taxation of Corporations in Canada* (1909); *Railway Transportation in America* (1909); *Taxation in Ontario* (1913); *Economic Survey of Canada* (1913); *Economics* (1914); *An Economic History of Russia* (1914); *A Short Economic History of Canada* (1915).

MAVROCORDATOS, mä'vrą-kôr-dä'tąs, ALEXANDER, PRINCE (1791–1865). A Greek statesman, born at Constantinople, of a Fanariote family celebrated for the part it has played in the affairs of Greece. He was a scholar and an ardent patriot and devoted himself with singleness of purpose to the cause of Greek independence, for which he expended the bulk of his private fortune. He prepared the Greek declaration of independence and the plan of a provisional government, was elected president of the first National Assembly (1822), and undertook the same year an expedition to Epirus, which ended in the unsuccessful battle of Peta; but he distinguished himself by his bold and resolute defense of Missolonghi (1822–23). Notwithstanding the opposition of the party of Kolokotronis and Demetrius Ypsilanti (see KOLOKOTRONIS; YPSILANTI) he was able afterward to render important services to his country in the heroic defense of Navarino and Sphagia. He was a steadfast admirer of English policy and institutions and a fierce opponent of the pro-Russian government of Capo d'Istria (q.v.). After the accession of King Otho (1832) he was at different times a cabinet minister and ambassador at various courts. In 1833 he was Prime Minister. The leading feature of his policy—his endeavor to promote British influence—made him at times very unpopular among his countrymen. At the outbreak of the Crimean War he became head of the cabinet, but resigned after remaining in office for little more than a year. He died Aug. 18, 1865. Consult Oscar Browning, *History of the Modern World,* vol. i (New York, 1912).

MAVROMICHALIS, mäv'rą-mē-kä'lēs. A Greek princely family of Maina in the Morea. Its more important members were: GEORGIOS, who led the Mainot revolt of 1770; PETROS (1775–1848), often called Petro Bey, who became Bey of Maina in 1816, led the revolt of 1821 in the Morea, became president of the Congress of Astros in 1822, and as leader of the Hellenic party opposed Capo d'Istria and his Russian policy and was imprisoned in Nauplia; and his brother KONSTANTINOS and son GEORGIOS, who had fought bravely in the war of independence and who in 1831 assassinated Capo d'Istria to avenge the imprisonment of Petro Bey. Georgios was court-martialed and executed and Konstantinos was killed by the President's followers. Petros was set at liberty by the new administration, and as a reward for his zealous support of Otho was made vice president of the Council of State. A younger branch of the family is still active in Greek politics.

MAWER, mąr, ALLEN (1879–). An

English scholar, born at South Hackney. He was educated at University College, London, where he won the Morley gold medal, at the University of London, and at Cambridge, where he was a fellow from 1905 to 1911. In 1905–08 he was lecturer in English in the University of Sheffield and in 1908 became professor of English language and literature at Armstrong College, Newcastle. Examiner for the mediæval and modern languages tripos at the universities of Leeds, Liverpool, and Wales, a member of the joint matriculation board of the northern universities, vice president of the Viking Society and editor of its *Saga-Book and Year-Book*, he wrote "The Vikings" in *Cambridge Manuals of Science and Literature* (1913) and edited English classics.

MAWMOISINE, WILLIAM. See MALVOISIN, WILLIAM.

MAW SEED (*maw*, AS. *maga*, Icel. *magi*, OHG. *mago*, Ger. *Magen*, stomach + *seed*). A common name for poppy seed, which is given to cage birds, especially when they are molting.

MAWSON, mą'son, SIR DOUGLAS (1882–). An Antarctic explorer and geologist who was born in Bradford, England, but early went to Australia, where he graduated (bachelor of mining engineering) from the University of Sydney in 1901 and (D.Sc.) in 1909 from the University of Adelaide. At the latter institution he lectured on geology in 1905, having already explored geologically the New Hebrides (1903). In Shackleton's (q.v.) expedition, where he was one of the scientific staff, with David and Murray, he reached and determined the position of the south magnetic pole on Victoria Land. Mawson organized and commanded the Australasian expedition (1911–14) to explore Antarctic lands south of Australia, where three stations were to be occupied for scientific observations. An intermediate station, equipped with wireless, was located on Macquarie Island (q.v.), while the principal stations were on the continent of Antarctica. Mawson occupied Commonwealth Bay, 67° S., 143° E., whence he discovered and explored King George V Land, from 138° to 153° E., and southward to 70° 30′ S., by journeys of 2400 miles, in which Ninnis and Mertz perished and Mawson himself had the narrowest of escapes. Dr. Wild took station on Shackleton Oceanic Ice Cap (which extends from the continent 180 miles northward over the sea), in 66.8° S., 95° E., and discovered and explored Queen Mary Land, between 87° and 101° E., by sledge trips of 800 miles without disaster. Geographically the continent of Antarctica, a high glacier-covered region, is now known to extend continuously between 86° E. and 150° W. The lands of Sabrina and Côte Clarie proved to be nonexistent. While the expedition was unable to reach Totten, Budd, and Knox Lands, Mawson reported that Wilkes's report of an Antarctic continent (1840) was fully confirmed, although at points oceanic ice caps and glaciers were mistaken by him for ice-clad lands. Mawson fixed a fundamental meridian for Adélie Land, while at sea Davis located the continental slope through 55° of longitude, and discovered Mill Rise, a submarine ridge south of Tasmania. Mawson's discoveries are more important and extended than any other Antarctic explorations made in the early part of the twentieth century, and this despite the essentially scientific purpose of the expedition. Particularly valuable data were gathered regarding the forms of animal life in the region. In 1915 the officers and men of the expedition were awarded the Polar medal by King George. For his services Mawson was knighted in 1914. In 1915 he visited the United States to tell, with the aid of remarkable pictures, the story of his Antarctic experiences. Besides geological works Mawson published an account of the expedition of 1911–14 under the title *The Home of the Blizzard* (2 vols., Philadelphia, 1915).

MAWSON, THOMAS H(AYTON) (?–). An English landscape architect and expert in town planning. He studied architecture, arboriculture, and horticulture and founded the house of T. H. Mawson and Sons, with offices in Vancouver as well as London and Lancaster. He was lecturer on landscape design at Liverpool University. The Mawsons laid out many elaborate gardens, notably those for Queen Alexandra of Denmark at Copenhagen, but their best-known work is city planning. Among the towns for which they made plans are: Calgary and Banff, Alberta; Vancouver, British Columbia; and in Great Britain, Exeter, Dunfermline, Sheffield, Southport, Burslem, and Bolton. Mawson wrote, besides descriptions of many of these particular plans, *The Art and Craft of Garden Making* (1900; 4th ed., 1912), *Civic Art* (1911)—both elaborate books.

MAX, mäks, GABRIEL (1840–). A German historical painter, of the Munich school. He was born July 23, 1840, in Prague, the son of the sculptor Joseph Max (1803–54). After his father's death he studied four years at the Academy of Prague, three years in that of Vienna, and from 1863 to 1869 under Piloty at Munich. His first notable success was achieved by "The Christian Martyr" (1867), a maiden bound to a rude stone cross, at whose feet a young Roman patrician, returning at dawn from revelry, lays down a garland. His next noteworthy productions were "The Nun in the Cloister Garden" (1869, Hamburg Gallery), and "The Anatomist (1869)—both strikingly sombre and pathetic and illustrative of the painter's morbid tendencies. His strongly individual art is often marred by an unwholesome combination of the sensational and the tragic. He prefers a delicate and subdued scheme of color, and in some of his landscapes, as "The Spring Gale" and "Adagio," he shows great poetic sensitiveness. Patient suffering is depicted in "The Blind Lamp Seller in the Catacombs" (1871) and in "Nydia," the blind Thessalian flower girl of Bulwer's *Last Days of Pompeii* (1874). One of his most touching pictures is "The Last Token" (1874, Metropolitan Museum, New York). The tragic element is best represented by "The Lion's Bride" (1875, Manchester Museum), probably his best-known work. The "Handkerchief of St. Veronica" (1874) created a sensation as a pictorial phenomenon, the Saviour's eyes appearing by turns to open and close. The spiritualistic tendencies which he later developed are revealed in such paintings as "Spirit Greeting" (1879) and "The Clairvoyant of Prevorst" (Prague Museum). His illustrations for Goethe's *Faust* and Wieland's *Oberon* are well known, and his beautiful mystical girls' heads and madonnas also deserve mention. Consult: Klemt, *Gabriel Max und seine Werke* (Vienna, 1887); Nicolaus Mann, *Gabriel Max' Kunst und seine Werke* (Leipzig, 1888); Meissner in *Die Kunst unserer Zeit* (Munich, 1899).

MAX, Wilhelm August Albert Golgov Odo, Prince of Saxony (1870–). A German Catholic theologian and authority on liturgy. The son of King George of Saxony and the youngest brother of King Frederick Augustus III, he was born in Dresden and was ordained to the priesthood in 1896. He was professor of canon law and liturgiology in the University of Fribourg, Switzerland, until 1911, and in 1912 became an instructor at the archiepiscopal seminary for priests in Cologne. In 1914–15 he was at the front as a regimental chaplain with the Saxon army and was popular with the Saxon soldiers as "Chaplain Max." Many of his sermons were published, including several in French preached in Paris at various times. Prince Max was one of the editors of the *Patrologia Orientalis* (1908 et seq.). His works, mostly on liturgy and on the Eastern church, include: *Vorlesungen über die orientalische Kirchenfrage* (1907); *Ritus Missæ Ecclesiarum Orientalium*, in five parts: *Syro-Maronitica, Chaldäica, Græca, Armenica, Syriaca-Antiochena* (1907–08); *Prælectiones de Liturgiis Orientalibus* (1908–13); a revised edition (German) of Chrysostom's homily on Matthew's Gospel (1910–11); an edition of Chrysostom on the eucharist (1910); *Ephesos und seine Ruinen* (1910); *Der Berg Athos in Mazedonien* (1910); an edition of Chrysostom on *Genesis* (1914).

MAXENTIUS, mäks-ĕn′shĭ-us. Roman Emperor. See Constantine I.

MAXENTIUS, Circus of. A circus (q.v.) on the Appian Way, about 2 miles from Rome, dedicated to Divus Romulus, the young son of Maxentius, who died in 309 A.D. It was 530 yards long by 86 yards in width and could accommodate, perhaps, 18,000 spectators. Its ruins throw much light on the Circus Maximus and other early circuses. Consult, for a diagram of it, W. Smith, *A Dictionary of Greek and Roman Antiquities*, vol. i, p. 432 (3d ed., London, 1890), and Baumeister, *Denkmäler des klassischen Altertums*, vol. i, p. 694 (Munich, 1889).

MAX′EY, Samuel Bell (1825–95). An American soldier, born at Tompkinsville, Ky. He graduated at the United States Military Academy in 1846 and served throughout the Mexican War. In 1850 he began to practice law at Albany, Ky., but at the outbreak of the Civil War raised a Confederate regiment, becoming its colonel; soon he was promoted brigadier general. He served under General Bragg, took part in the attack on Buell's retreating army, and was at the first siege of Port Hudson. In 1863, having been assigned to the command of Indian Territory, he organized an army of 8000, defeated Gen. Frederick Steele, and captured his train of 227 wagons. For these services he was promoted major general. In 1874 he was elected United States Senator and in 1881 was reëlected, serving as chairman of the Committee on Post Offices.

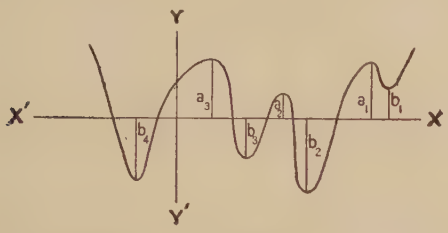
MAXIM. See Aphorism; Gnome; Maxims.

MAX′IM, Sir Hiram Stevens (1840–1916). An engineer and inventor, born at Sangersville, Me., where he received his early education. After being apprenticed to a coach builder, he worked in a machine shop at Fitchburg, Mass., later becoming foreman of an instrument factory. After this he worked at the Novelty Iron Works and Shipbuilding Company in New York. Meanwhile he had patented various improvements in steam engines and had put on the market an automatic gas machine. In 1878 he invented an improved incandescent lamp. In this field he made other important inventions, some of which were exhibited at the Paris Exposition of 1881. In the meantime in 1880 he had gone to Europe and there proceeded to develop his most celebrated invention, the Maxim gun. (See Machine Gun.) This weapon is automatically loaded and fired by the energy of the recoil. More than 100 international patents relating to petroleum and other motors, etc., were taken out by him. His inventions also included explosives and ordnance materials. For many years he was a member of the British ordnance firm of Vickers Sons and Maxim. He bought an estate near Bexley, England, where he erected his laboratories and experimental station and there carried on elaborate experiments in aëronautics (q.v.), constructing in 1894 a large-power flying machine. He became a naturalized citizen of Great Britain, alleging unfair treatment of his inventions by the United States government. He was made Chevalier of the Legion of Honor and was knighted in 1901. He published *Artificial and Natural Flight* (1908). Consult his autobiography, *My Life* (New York, 1915).

MAXIM, Hudson (1853–). An American inventor and engineer, born at Orneville, Me. He was educated in the local schools and at the Wesleyan Seminary, Kent's Hill, Me., and devoted himself to the study of chemistry, engineering, and natural science, at the age of 22 formulating an hypothesis of the compound nature of atoms. From 1883 to 1888 he was engaged in the printing and publishing business at Pittsfield, Mass., devising a process for printing daily papers in colors. In 1888 he became interested in ordnance and explosives and was among the first to make smokeless powder in the United States. Extending this business, he developed the multiperforated smokeless cannon powder, which is in use by the United States government; in 1901 he sold to the same government the secret of the high explosive, maximite (q.v.). Later inventions include various processes connected with the electric furnace; a detonating fuse for high-explosive projectiles; automobile torpedoes; stabillite, a smokeless powder invented by him and developed by him in connection with the E. I. du Pont de Nemours Powder Company; motorite, a self-combustive material for driving torpedoes; and a torpedo ram. He is author of *The Science of Poetry and Philosophy of Language* (1910); *The Game of War* (1912); *Chronology of Aviation* (1912); *Defenseless America* (1915).

MAX′IMA AND MIN′IMA (Lat., neut. pl. of *maximus*, greatest, and *minimus*, least). In mathematics, the greatest and the least values of variable quantities or magnitudes. Strictly speaking, a maximum is not necessarily *the* greatest of all the possible values of a variable; it is a value which is greater than the values *immediately* preceding and following it in the series. Similarly, a minimum, strictly defined, is a value which is less than the values *immediately* preceding and following it. Hence a function may have several maxima and minima, equal or unequal among themselves. Thus, in the accompanying figure, a_1, a_2, a_3 are maximum values of the ordinates of $f(x)$, and b_1, b_2, b_3, b_4 are minimum values. The tangent of the angle which a line tangent at any point to the curve makes with the X axis is zero at a maximum

or minimum value of the ordinate. This means that the differential coefficient $\frac{dy}{dx} = 0$ (see CALCULUS), and hence the abscissas corresponding



to the maxima and minima are the roots of $\frac{dy}{dx} = 0$.

A function of two independent variables, $f(x, y)$, has a maximum value when $f(x, y) > f(x + h, y + k)$ for all small values of h and k, positive or negative; and a minimum value when $f(x, y) < f(x + h, y + k)$. The conditions for maxima and minima in the case of a function u of two variables are $\frac{\delta u}{\delta x} = 0$ and $\frac{\delta u}{\delta y} = 0$. If $A = \frac{\delta^2 u}{\delta x^2}$, $B = \frac{\delta^2 u}{\delta x \delta y}$, and $C = \frac{\delta^2 u}{\delta y^2}$, the further conditions for a maximum are $B^2 < AC$ and $A < 0$, and for a minimum $B^2 < AC$ and $A > 0$. When $B^2 = AC$ or $A = B = C = 0$, further investigation is necessary.

A few of the important propositions of plane maxima and minima are: (1) of all triangles formed with the same two given sides, that triangle is the maximum whose sides contain a right angle; (2) of all isoperimetric triangles (those of equal perimeters) on the same base, the isosceles is the maximum; (3) of all isoperimetric triangles, that which is equilateral is the maximum; (4) of all triangles having the same base and area, the isosceles has the minimum perimeter; (5) if a line of given length be bent and its ends joined by a straight line, the area of the figure inclosed is a maximum when the curved line has the form of a semicircle; (6) of all isoperimetric plane figures, the maximum is a circle; (7) of all isoperimetric polygons of a given number of sides, the maximum is regular.

Traces of the doctrine of maxima and minima are to be found in the works of Apollonius on conic sections and among the theorems of Zenodorus. The Hindus displayed great ingenuity in solving, by ordinary algebra, problems of maxima and minima; but thorough investigation of the subject requires the aid of the calculus, and Kepler, Newton, the Bernoullis, together with Maclaurin, Euler, Lagrange, and several other eighteenth-century mathematicians, distinguished themselves in this department. See CALCULUS.

MAX'IM GUN. See MACHINE GUN.

MAXIMIAN, or **MAXIMIAN I.** See DIOCLETIAN.

MAX'IMIA'NUS. A Latin elegiac poet of the sixth century A.D. The author, whose name may be merely borrowed from a character in the fourth of the six elegies, deals in a dramatic and realistic way with variations on the theme "love and old age"; he laments the loss of his youth. His diction and metre are far above the average of the period. The elegies, which show a knowledge of the best works of the Augustan age, were popular during the Middle Ages and were frequently imitated. They were translated in part in several early English manuscripts and in their entirety, under the title *The Impotent Lover*, by H. W[alker?] (1689), who, like several early editors, ascribed them to Cornelius Gallus. They were edited by Petschenig (1890) and by Richard Webster with commentary (Princeton, 1900). Webster's edition, together with Giardelli's *Studio sulle elegie di Massimiano* (Savona, 1899) and F. Heege's *Der Elegiker Maximianus* (Blaubeuren, 1893), was reviewed by R. Ellis in the *Classical Review*, vol. xv, pp. 368–371 (1901).

MAXIMIANUS I. A Roman emperor. See DIOCLETIAN.

MAXIMIANUS II. A name sometimes applied to Valerius Maximianus Galerius (q.v.), a Roman emperor.

MAX'IMIL'IAN I (1459–1519). Holy Roman Emperor from 1493 to 1519. He was the son and successor of Frederick III and was born at Wiener-Neustadt, near Vienna, March 22, 1459. His first wife, whom he married in 1477, was Mary of Burgundy, daughter and sole heiress of Charles the Bold (q.v.), Duke of Burgundy and sovereign of the Netherlands. Maximilian became at once involved in war with Louis XI of France, who laid claim to Burgundy and other parts of Mary's inheritance. Maximilian won the battle of Guinegatte in 1479, but was finally compelled in 1482 to conclude the Treaty of Arras with Louis, who retained Burgundy, Artois, and Franche-Comté. The bulk of the Netherlands, the most opulent realm in Europe, remained with the Hapsburgs. In 1486 Maximilian was elected King of the Romans at Frankfort. In 1488 the Flemings rose against Maximilian, who was held a prisoner at Bruges for three months. In 1490 he made a successful incursion into Hungary and soon after became master of the Austrian crownlands. In the same year he got possession of Tirol. He again took up arms against France, whose King, Charles VIII, had married Anne of Brittany, in order to acquire that great duchy, after a matrimonial alliance had been concluded between that Princess and Maximilian. By the Treaty of Senlis, in 1493, Maximilian recovered Artois and Franche-Comté. In the same year he succeeded his father on the Imperial throne of Germany. Soon afterward, Mary of Burgundy having died in 1482, he married Bianca, a daughter of the late Duke of Milan, Galeazzo Sforza, and thus was involved subsequently in the Italian wars. He joined the League of Cambrai against Venice in 1508 and the Holy League against France in 1513, and after Francis I's victory at Melegnano (1515) (q.v.) was forced to cede Milan to the French. Nor was Maximilian more successful against the Swiss, who in 1499 completely separated themselves from the German Empire. By the marriage of Philip, the son of Maximilian, with the Infanta Joan, daughter of Ferdinand and Isabella, the house of Hapsburg, in 1516, ascended the throne of Spain in the person of Charles I (Maximilian's successor in the Empire as Charles V). The marriage of two of Maximilian's grandchildren with the son and daughter of Ladislas, King of Hungary and Bohemia, ultimately brought both these kingdoms to the Austrian monarchy. Maximilian died at Wels, in Upper Austria, Jan. 12, 1519. As an administrator Maximilian sought to strengthen the organization of the Empire. Reforms in the administra-

tion were introduced by the establishment of the Imperial Chamber and the Aulic Council (q.v.). Maximilian wrote works on the art of war, hunting, gardening, etc., and sketched the *Weisskunig*, an autobiographic poem. His frank and generous nature and his many accomplishments gained him the title of Last of the Knights.

Bibliography. Heyck, *Kaiser Maximilian I* (Bielefeld, 1898); Gottlieb, *Die Ambraser Handschriften Maximilians I.* (Leipzig, 1900); R. Watson, *Maximilian I.* (London, 1902); *Cambridge Modern History,* vol. i (New York, 1903); Paul van Dyke, *Renascence Portraits* (ib., 1905); Jansen, *Kaiser Maximilian I.* (Munich, 1905).

MAXIMILIAN II (1527–76). Holy Roman Emperor from 1564 to 1576. He was the eldest son of the Emperor Ferdinand I and was born in Vienna, July 31, 1527. He was educated in Spain with his cousin, Philip II. In 1548 he married his cousin Maria, daughter of Charles V. Notwithstanding the surroundings in which he had been educated, his attitude towards the Reformation was so liberal that he was even considered by those about him to be at heart a heretic. The Protestants of Germany hoped that they might have a Protestant emperor of the house of Hapsburg. These hopes remained unfulfilled. Lack of decision, dynastic policy, his personal ambitions, all united to keep Maximilian in his allegiance to the Church. He was crowned King of Bohemia and elected King of the Romans in 1562 and was elected King of Hungary in 1563. In 1564 he succeeded his father on the Imperial throne of Germany, in Bohemia, and in the portion of Hungary not under the sway of the Turks or the Transylvanian princes. In 1566 Solyman the Magnificent (q.v.) determined to make a fresh onslaught upon the power of Austria. His vast army was arrested by the heroic defenders of Sziget, and the great Sultan died in his camp before the stronghold fell. Maximilian displayed great inactivity in the face of the impending danger and concluded a disadvantageous treaty with Solyman's successor. The marriage of Maximilian's daughter Anne with Philip II, and the hope held out to him by the Pope that he might acquire the Polish Kingdom, dampened the Emperor's interest in the Protestant cause. He interceded with Philip in behalf of the Protestants of the Low Countries, but without much success. Under his tolerant rule Germany enjoyed a period of comparative tranquillity. Consult: Koch, *Quellen zur Geschichte Maximilians II.* (2 vols., Leipzig, 1857–61); Hopfen, *Kaiser Maximilian II. und der Compromisskatholizismus* (Munich, 1895); Scherg, *Ueber die religiöse Entwickelung Kaiser Maximilians II. bis zu seiner Wahl zum römische König* (Wurzburg, 1903). See AUSTRIA-HUNGARY.

MAXIMILIAN, FERDINAND JOSEPH (1832–67). Archduke of Austria and Emperor of Mexico, born at Schönbrunn. He was the second son of the Austrian Archduke Francis Charles and a brother to the Emperor Francis Joseph of Austria. He was liberally educated, became commander of the Austrian navy in 1854, was mainly instrumental in creating the naval port of Trieste, and later served with success as Governor of Lombardy and Venetia. He traveled extensively in Europe and made a voyage to the countries of South America. In 1862–63 the French troops of Napoleon III intervened in the internal affairs of Mexico and on June 11, 1863, occupied the city of Mexico. (See MEXICO, *History;* JUÁREZ.) On July 19 the French commander convened an Assembly of Notables, which proclaimed an empire and offered the crown to Maximilian. He announced that he would accept the throne upon the condition that his choice should be ratified by "a vote of the entire country" and that guarantees for the protection of the Empire from the dangers which threaten its integrity and independence should be given. Marshal Bazaine secured the popular vote in the territory held by the French troops, and Napoleon signed the Treaty of Miramar, by which he bound himself to maintain the French army in Mexico until the army of the Empire should be thoroughly organized. Thereupon Maximilian renounced his rights to the Austrian throne and, contrary to the advice of the Emperor Francis Joseph, accepted the Mexican crown. On May 29, 1864, Maximilian, with the Empress Carlotta, daughter of King Leopold of Belgium, landed at Vera Cruz. The new ruler announced that his mission was "the regeneration of Mexico." Ignorant of the characteristics of the country and its people, he endeavored to conciliate all parties, but soon found himself without the cordial support of any. He alienated the clerical party by failing to repeal the reform laws. Desiring to rule without the French, he neglected their representatives, until he suddenly realized that the foreign army, hated equally by all divisions of his subjects, was the only power really behind his throne. Influenced by unwise councils, the Emperor issued the Decree of Oct. 3, 1865, declaring that all persons bearing arms against his Empire were bandits, and if caught would be tried by court-martial and shot. Before the end of the month four highly esteemed Republican officers had been executed in accordance with this decree, and the last hope of popular support for Maximilian's rule had been destroyed. Meantime the United States government, relieved of its embarrassments by the fall of the Confederacy, succeeded in convincing the French Emperor that his intervention in Mexico would not be tolerated. In consequence on May 31, 1866, Maximilian received dispatches announcing that all French troops would be withdrawn from Mexico. Maximilian would probably have resigned at once had not the Empress Carlotta dissuaded him, undertaking to go to Europe and use her influence with Napoleon III. She proceeded to Paris, where the Emperor at first refused to see her and finally brutally asked her to leave France. The Pope gave her little better consolation, and she became hopelessly insane. (See CARLOTTA.) Maximilian again considered abdication, but referred the decision to his Council, which voted against it. The Church party, also, came forward with an offer to support the Emperor, and he decided to make another effort to regenerate the country. Generals Miramón, Marquez, and Mejía were placed in charge of the Imperial forces, and Maximilian moved his seat of government to Querétaro. There he was surrounded by the Republican army in the early part of March, 1867. On May 14, plans were made for a sortie by which the Emperor might escape to Mexico City or to the coast. Before such plans could be carried out, Col. Miguel López, a constant favorite of the Emperor and Empress and one who had received many proofs of their gener-

osity, informed the enemy of the plan and arranged to admit them into the Imperial camp. Maximilian and his generals were forced to surrender, and after a short confinement were tried by a military court. The Emperor was accused of treason, usurpation of public power, filibustering, trying to prolong the civil war, and of signing the Decree of Oct. 3, 1865. He was declared guilty and condemned to be shot, together with Generals Miramón and Mejía. The execution took place on the morning of June 19, 1867. The Emperor's body was eventually surrendered to the Austrian government and now rests in the Imperial vault in Vienna. On account of the execution the relations of Austria and Mexico were broken and have been resumed only within recent years. Maximilian was a prolific writer; his writings were published in 1867, just after his death, at Leipzig in seven volumes, under the title *Aus meinen Leben, Reiseskizzen, Aphorismen, Gedichte.* Of this work an indifferent English translation was made the following year, entitled *Recollections of my Life.*

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MAXIMILIAN I (1573–1651). A Duke of Bavaria, prominent in the Thirty Years' War, born in Munich. He was educated at the Jesuit University of Ingolstadt. He succeeded his father in 1597 and in the internal administration of his realm displayed much statecraft, improving the judicial and executive departments, organizing a militia effective for defense, maintaining a well-disciplined standing army under the famous Count of Tilly (q.v.), and placing the treasury upon a secure basis. In the affairs of the Empire he was an active opponent of the Protestant cause. When in 1607 the ban of the Empire was pronounced against the free city of Donauwörth (q.v.), he was appointed to occupy the town, which he forthwith proceeded to make Roman Catholic. As a result of his methods, the Protestant Union was organized in 1608. He in turn established the Catholic League (1609), with himself at its head. After the disturbances in the Austrian Estates (1618–19) he sided with the Emperor Ferdinand II (q.v.), and arrangements were made (1619) by which he was to receive the Upper Palatinate and the electoral dignity of Frederick V (q.v.). His army, commanded by Tilly, defeated that of Frederick under Christian of Anhalt at the battle of the White Mountain (Nov. 8, 1620) and occupied the Palatinate, which was completely devastated, contrary to Maximilian's treaty obligations. It was he who, in opposition to any extension of the Imperial power through Wallenstein's army, effected Wallenstein's dismissal at the Diet of Regensburg (1630). During the Swedish period of the war he was driven from Munich by the entrance of Gustavus Adolphus into Bavaria in 1632. In 1637–38 he fought against the Swedes and French on the upper Rhine, but in 1647 independently concluded the Truce of Ulm. He has been considered the most important German statesman of the time. Consult Wolf, *Geschichte Maximilians I. und seiner Zeit* (continued by Breyer, 4 vols., Munich, 1807–11), and Högl, *Die Bekehrung der Oberpfalz durch Kurfürst Maximilian I.* (Regensburg, 1903). See THIRTY YEARS' WAR.

MAXIMILIAN II, EMANUEL (1662–1726). An elector of Bavaria, grandson of Maximilian I. He succeeded his father, Ferdinand Maria, in 1679; fought for Austria against the Turks in Hungary (1683); and in 1685 married Maria Antonia, daughter of the Emperor Leopold I. Appointed Governor of the Spanish Netherlands in 1692, he resigned this thankless post after the death of his son, who had been named heir to the Spanish throne. He sided with France in the War of the Spanish Succession, Louis XIV having promised him the Spanish Netherlands. But the defeat of Höchstädt (1704) more than outweighed his previous victories, as he lost all his territory; the Elector was forced to take refuge in the Netherlands and was not restored until the Peace of Baden in 1714. In 1717 he again fought with Austria against the Turks. Consult Ruith, *Kurfürst Max Emanuel von Bayern und die Donaustädte* (Ingolstadt, 1889).

MAXIMILIAN I (MAXIMILIAN JOSEPH) (1756–1825). First King (originally Elector) of Bavaria. A younger son of the Count Palatine Frederick of Zweibrücken-Birkenfeld, he entered the French army in 1777, but resigned as major general at the beginning of the Revolution, when he served in the Austrian army. In 1795 he succeeded his brother Charles II as Count Palatine in Zweibrücken, and in 1799 succeeded Charles Theodore as Elector of Bavaria. His domestic policy was excellent, looking towards general reform. He aimed at dynastic aggrandizement and, as a reward for his support of Napoleon, received the title of King, which he assumed in 1806, and important accession of territory in Swabia and Franconia, together with Tirol and later Salzburg, both of which he had afterward to relinquish. He was the most important unit in the newly formed Confederation of the Rhine. In the War of Liberation he reluctantly sided with the allies. His liberal policy at home was shown by his grant of the constitution of 1818, which unified his scattered domains.

MAXIMILIAN II (MAXIMILIAN JOSEPH) (1811–64). King of Bavaria. He was the son of Louis I; studied at Göttingen and Berlin; traveled in Germany, Italy, and Greece; and gave himself, while prince, to a quiet life surrounded by men famous in art and literature. On his father's abdication in 1848 Maximilian ascended the throne and made concessions to the liberal spirit of the time, but though he favored German unity, he looked with hostility upon Prussia and turned rather to Austria as the leader in the movement of unification. Trost and Leist published his correspondence with Schelling (Stuttgart, 1890).

MAXIMILIAN, ORDER OF. A royal Bavarian order, with but one class, founded by Maximilian II in 1853 for distinction in science and art. It is intended especially for German scholars and artists, and its membership is limited to 100. The King is the grand master.

MAX'IMIL'IA'NA. See INAJA PALM.

MAX'IMI'NUS, GAIUS JULIUS VERUS. A Roman emperor (235–238 A.D.). He was originally a Thracian shepherd. Attracting the at-

tention of the Emperor Septimius Severus by his immense size and wonderful feats of strength and agility, he was admitted to the army, was rapidly advanced for his bravery, was put in command of a new legion raised in Pannonia, and obtained great influence over the soldiers. At the head of this legion he followed Alexander Severus in his campaign against the Germans. When the army was encamped on the banks of the Rhine, he conspired against Alexander and caused him to be put to death in his tent, with his mother Mammæa (235 A.D.). Being proclaimed Emperor, he named his son Maximus Cæsar and made him colleague in the Empire. He continued the war against the Germans and devastated a large territory beyond the Rhine. But his cruelty and rapacity aroused the indignation of the people. For alleged conspiracy against him he put to death Magnus, a senator, with 4000 other persons, and for the Imperial treasury confiscated the municipal property. He opposed Christianity and persecuted the bishops who had been favored by Alexander. The provinces of Africa revolted and proclaimed Gordianus Emperor; the latter was soon after acknowledged by the Senate and people (March, 238), but died after a brief reign. (See GORDIANUS I.) Fearing the vengeance of Maximinus, the Senate then proclaimed as emperors Pupienus Maximus and Balbinus, and with them was associated, by order of the people, the third Gordianus. Maximinus, having crossed the Isonzo, laid siege to Aquileia in Italy, but met with strong resistance from the garrison and people. The soldiers mutinied and killed both him and his son June 17, 238.

MAXIMINUS DA'ZA, or **DA'IA,** GALERIUS VALERIUS. A Roman emperor (308–313 A.D.), by birth an Illyrian shepherd. When Diocletian and Maximian abdicated (305 A.D.), Galerius, uncle of Maximinus, and Constantius Chlorus were made Augusti, and Flavius Severus and Maximinus Daza became Cæsars, and Daza received the Government of Syria and Egypt. Early in 308 he proclaimed himself Augustus. In 311, after the death of Galerius, he became supreme in Asia. He is said to have persecuted the Christians relentlessly. In 313 war broke out between Daza and Licinius, the successor of Flavius Severus, and ended with the defeat and death of Daza in August of the same year. Consult *The Cambridge Mediæval History*, vol. i (New York, 1911).

MAX'IMITE (named for its inventor, Hudson Maxim, q.v.). A high explosive, used to some extent as a bursting charge for armor-piercing projectiles. Its composition is a secret, which was acquired by the United States government in 1901, but it is known to be a picric acid compound and is said to be 50 per cent more powerful than ordinary dynamite. Though easily detonated by a suitable fuse, it is practically impossible to explode maximite by shock, and it can withstand not only discharge from a gun, but also the shock of impact of the projectile on the target, not being exploded until the fuse operates. Unconfined maximite burns slowly without explosion, and its property of melting and of solidifying on cooling enables projectiles to be filled with it with great facility. See EXPLOSIVES; PROJECTILES.

MAX'IMS (Fr. *maxime*, from ML. *maxima*, maxim, abbreviation of *maxima propositio*, chief premise, fem. sing. of Lat. *maximus*, greatest, superlative of *magnus*, great), LEGAL. A term used by members of the legal profession and writers on jurisprudence to denote those brief and pithy utterances which by general consent have been accepted as stating in condensed, though necessarily imperfect, form the general principles which are the foundation of both law and equity. As the ultimate foundation of these general principles is the natural law of justice, safety, and public policy, the basis of the common or customary law is the same in all countries, and its general principles remain substantially unchanged by statute or local enactment. Hence many of the utterances of ancient Roman magistrates and authors of legal treatises retain as much force and truth as when first promulgated.

In very few instances can the maxims be traced to their original sources. Many are derived from the Roman law; many are from continental jurists of the Middle Ages; while a very large number were enunciated by early English judges and writers, and still others are of quite modern origin. Like other expressions of the common law, maxims derive their force and authority, in the first place, from the truth and justice of the principles which they enunciate, and, secondly, from the universality of their acceptance and application by courts in the past. They are not, therefore, of absolutely equal and binding authority, and it is impossible to draw a line strictly dividing accepted maxims from mere expressions of opinion. The number of those universally accepted as having some authority in law is very large indeed. Works devoted entirely to the consideration of the meaning and application of this form of law have been published by several authors.

Examples are: *Ratio est anima legis*—reason is the soul of the law; *Caveat emptor*—let the buyer be on his guard—an important principle of the law of sales, viz. that the buyer gets no better title than the vendor has; *Qui facit per alium, facit per se*—he who acts by another, acts himself—in which may be seen the main principle of the law of agency; *Æquitas sequitur legem*—equity follows the law; *Ex nihilo nihil fit*—from nothing comes nothing; *Fraus est celare fraudem*—to conceal a fraud is itself a fraud; *A l'impossible nul n'est tenu*—no one is bound to do what is impossible—the language being what is called law French; *Ubi jus, ibi remedium*—where there is a legal right there is a legal remedy; *Ignorantia legis neminem excusat*—ignorance of the law excuses no one; *Prior tempore, potior jure*—first in time, first in right; *Id certum est, quod certum reddi potest*—that is certain which may be rendered so. Among those commonly given in English may be mentioned: Acts indicate the intention; When the equities are equal the law shall prevail; Once a mortgage, always a mortgage; The king can do no wrong; Who seeks equity must do equity.

The difficulty in practically employing maxims is twofold: first, in correctly amplifying and expounding the extended meaning sought to be conveyed in the condensed form; and, secondly, in properly applying it to the adjudication of the particular facts of the case in question; and it is the work more especially of the writer of treatises on the various branches of law and equity to perform the first duty, while to the active practitioners and to the judges emergencies are constantly presented calling for the exercise of the latter function. It may safely be

said that legal maxims play a much less important part in the law than formerly. Generally they have lost whatever character they may have possessed in early times as precise governing rules determining the rights of parties to a litigation. They are now regarded only as convenient forms of expression denoting important legal principles which have many variations or modifications, and consequently are not capable of any complete statement or exposition which at the same time has the convenience of brevity. An important collection of legal maxims was published by Lord Bacon (1596). The latest is that of Broom, *Legal Maxims* (7th ed., London, 1900). Consult also Wharton's *Law Lexicon* (ib., 1902), and *Encyclopedia of the Laws of England* (2d ed., ib., 1908).

MAX'IMUS. The name of four Roman emperors.—MARCUS CLODIUS PUPIENUS MAXIMUS, elected by the Senate, when he was 74 years of age, as the colleague of Balbinus (q.v.) in 238 A.D., but soon afterward murdered by the prætorian guards. He had won distinction as a soldier and had been proconsul of Bithynia, Achæa, and Gallia Narbonensis.—MAGNUS CLEMENS MAXIMUS, born of obscure parentage in Spain. From 368 he held high military rank in Britain, and was proclaimed Emperor by his soldiers, as a result of their disaffection towards Gratian, whom he defeated (383). (See GRATIANUS AUGUSTUS.) Theodosius and Valentinianus II were induced to recognize him as their colleague and as Augustus of Gaul, Spain, Britain, etc.; but, when he sought to extend his sway over Italy also, he was, in spite of initial successes, defeated by Theodosius, taken prisoner, and executed (388).—MAXIMUS TYRANNUS, proclaimed Emperor in Spain (408) when Gerontius rebelled against the usurper Constantine III. He was deposed on the defeat of Gerontius (411), but again rebelled (418), and was defeated and slain (422).—PETRONIUS MAXIMUS, the intimate friend of Valentinianus III, against whom he turned (455), because of the treatment of his wife by the Emperor. He succeeded Valentinianus after his murder in the same year; but at the end of three months Maximus was slain as he was fleeing from an invasion of the Vandals, invited by Eudoxia, the widow of Valentinianus.

MAXIMUS, SAINT, called CONFESSOR (c.580–662). An advocate of orthodoxy against the Monothelite heresy. He was born in Constantinople and served the Emperor Heraclius, 610–630, at which latter date he entered the monastery of Chrysopolis (Scutari). He urged Pope Martin I, at the first Lateran Synod, 649, to anathematize the Monothelite doctrine, in which condemnation Heraclius and Constans II were implicated. By command of the latter, Maximus was banished to Thrace, 655; being recalled to Constantinople in 662, he was commanded to accept the Monothelite heresy. Refusing to do so, his tongue was cut out, his right hand cut off, and he was banished to Lazika, Colchis, where he died Aug. 13, 662. He is called among the Greeks Theologos and is venerated as a saint by the Western and Eastern churches. In the Western church his day is August 13; in the Eastern, January 21 and August 12 and 13. He was a voluminous author; his works are in Migne, *Patrol. Græca*, xc–xci.

MAX-MÜLLER, FRIEDRICH. See MÜLLER, FRIEDRICH MAX.

MAX'WELL, JAMES CLERK- (1831–79). One of the greatest of modern physicists. He was born in Edinburgh, the only son of John Clerk-Maxwell of Middlebie, Scotland, receiving his early education at the Edinburgh Academy, and his first published scientific paper, *On the Description of Oval Curves*, was read for him by Professor Forbes before the Royal Society of Edinburgh before he was 15. He spent three years at the University of Edinburgh, where he pursued most zealously the study of mathematics, physics, chemistry, and philosophy, devoting considerable time to experimental research. During this period he wrote two valuable papers, *On the Theory of Rolling Curves* and *On the Equilibrium of Elastic Solids*. He went to Cambridge University in the autumn of 1850 and there made a brilliant record as a student, graduating in 1854 with the position of second wrangler and being equal with the senior wrangler in the competition for Smith's prize. In 1856 he became professor of natural philosophy in Marischal College, Aberdeen, and in 1860 professor of natural philosophy in King's College, London. He was successively scholar and fellow of Trinity and became, in 1871, the first professor of experimental physics in the University of Cambridge, a post for which he was in every way preëminently qualified. The Cavendish laboratory was erected and furnished under his supervision. The great work of his life is his treatise on *Electricity and Magnetism* (2 vols., 1873). He had previously, from 1856 onward, published various papers on these subjects, following very closely the experimental procedure of Faraday. Using the discoveries of this great experimenter, Maxwell so connected and arranged them as to make the material available for mathematical discussion and treatment. He early advanced the view that electric or magnetic forces result from changes in the distribution of the energy which is stored up in the ether and are not produced by the attractions of electric or magnetic matter which is distributed over the surfaces of conductors or magnetic substances. He then demonstrated that electromagnetic action traveled through space in the form of transverse waves similar to those of light and having the same velocity. Maxwell's theory was corroborated by Hertz, who not only produced these waves, but showed that they are propagated just as waves of light are, and experience reflection, refraction, and polarization, and he also measured their velocity. Subsequent experiments amply confirmed Maxwell's hypothesis that electricity and light are the same in their ultimate nature. After Maxwell's researches on electricity and magnetism comes his work on color, the well-known Maxwell disks and color box being his inventions. He showed that any given color could be produced by the combination of three colors selected from different parts of the spectrum. These three fundamental colors would correspond to three different sets of nerves or sensations in the eye, each excited proportionately to the amount of its appropriate color in the compound color. The absence of any one set of sensations would occasion color blindness.

A paper on the *Stability of Motion of Saturn's Rings* gained for Maxwell the Adam's prize from the University of Cambridge in 1857 and led to the conclusion that the rings must either be fluid or else consist of a large number of small particles. The kinetic theory of gases was also investigated by Maxwell, and the results of

his study are given in a number of papers in the *Philosophical Transactions, Philosophical Magazine,* and the reports of the British Association. Maxwell was a member of the electrical standards committee appointed by the British Association in 1862 and served on a subcommittee to construct the standard of resistance, which was produced from experiments made in his laboratory at King's College. Among his many papers and works a small treatise on dynamics, *Matter and Motion,* will be found of great interest to the general reader, as it contains a clear and comprehensive statement of the principles underlying this science. A memorial edition of Maxwell's scientific papers published by the Cambridge University Press was published in 1890. Consult: Campbell and Garnett, *Life of James Clerk-Maxwell* (London, 1882); R. T. Glazebrook, *James Clerk-Maxwell and Modern Physics* (ib., 1896).

MAXWELL, William Babington (c.1876–). An English novelist, son of M. E. Braddon (q.v.), the novelist, and John Maxwell, a London publisher. He wrote *The Last Man In,* a drama, produced March 14, 1910, at the Royalty Theatre, Glasgow, by the Scottish Repertory Company; and, with George Paston (i.e., Emily Morse Symonds), a farce, *The Naked Truth,* which was first played at Wyndham's Theatre, London, in April, 1910, and in which Charles Hawtrey played Bernard Darrell. His better-known work includes the following novels, mostly pathological in subject, almost all rather sensational (for a British public), but well written and constructed: *The Countess of Maybury* (1901); *Fabulous Fancies* (1903); *The Ragged Messenger* (1904; American ed., 1915), a story of a modern Messiah, which in 1915 was dramatized for Walker Whiteside; *Vivien* (1905), a melodrama of earls and shopgirls; *The Guarded Flame* (1906), a well-documented story of the young wife of an eminent scientist; *Odd Lengths* (1907); *Hill Rise* (1908); *Seymour Charlton* (1909); *The Rest Cure* (1910), a contest between business ambitions and domestic affections; *Mrs. Thompson* (1911), a middle-aged woman in business and in love; *In Cotton Wool* (1912), picturing the degeneracy of the idle rich; *General Mallock's Shadow* (1912), a tale of Yorkshire mill riots; *The Devil's Garden* (1914), which was so frank that the English Libraries' Association refused to handle the book.

MAXWELL, William Hamilton (1792–1850). An Irish novelist, born at Newry, County Down. He graduated B.A. at Trinity College, Dublin, in 1812; served in the Peninsular campaigns and at Waterloo; took orders in the Church of England and was appointed to the rectory of Ballagh in Connemara, in the extreme west of Ireland. As there was no other Protestant in the parish, he devoted himself to sport and to novel writing. He retired from his living in 1844 and settled near Edinburgh, where he died Dec. 29, 1850. Maxwell has a place in the development of English fiction as the founder of the military novel. His best work is represented by *Wild Sports of the West, with Legendary Tales and Local Sketches* (1832), an account of a sporting season in the west of Ireland; *Stories of Waterloo* (1834); *Captain Blake* (1835), a capital story, racy and full of "divilment," of the gentry of western Ireland, from which—and perhaps also from parts of *Wild Sports of the West*—Maxwell's friend Lever probably took the suggestion for his own Irish novels; *The Bivouac, or Stories of the Peninsular War* (1837). He wrote an autobiography under the title *Rambling Recollections of a Soldier of Fortune* (1842) and a popular life of Wellington (1839–41).

MAXWELL, William Henry (1852–1920). An American educator, born at Stewartstown, County Tyrone, Ireland, and educated at Queen's University (Ireland). He came to America in 1874, was a teacher in the Brooklyn night schools, became assistant superintendent of Brooklyn schools in 1882, superintendent in 1887, and in 1898 was made superintendent of all the schools in Greater New York. Especially interested in the teaching of English, he published English grammars. He urged a State requirement of college education for public-school teachers and raised the requirements in teachers' examinations. His policies often brought him into conflict with Thomas W. Churchill, who became president of the Board of Education in 1913.

MAXWELL, Sir William Stirling-. See Stirling-Maxwell.

MAY. See May-Day; Month.

MAY, Cape. See Cape May.

MAY, Edward Harrison (1824–87). An American figure and portrait painter, born in London. He was brought to America when a child and first studied under Daniel Huntington. Afterward he studied with Couture in Paris and made his home there. His pictures are usually large canvases of the academic type, excellent in draftsmanship and composition and warm in color, but lacking in personal expression. They include "The Dying Brigand" (1855), in the Pennsylvania Academy, and "Mary Magdalen at the Sepulchre" (1873), in the Metropolitan Museum, New York. His portraits include those of Laboulaye (1866) and of Anson Burlingame (1869).

MAY, Field of. See Champ de Mars.

MAY, John Wilder (1819–83). An American lawyer, born at Attleboro, Mass. He graduated at the University of Vermont in 1846, was admitted to the Massachusetts bar in 1851, and practiced in Roxbury and Boston. In 1867 he was elected to the Legislature and became district attorney of Suffolk County. May was judge of the Boston municipal court (1873); editor of Angell's *Limitations* (1876), Greenleaf's *Evidence* (1876), and Stephen's *Digest of the Law of Evidence* (1877); and author of *The Law of Insurance* (1874–82, and often) and *The Law of Crimes* (3d ed., 1905).

MAY, Lyoff. See Mei, L. A.

MAY, Phil (1864–1903). An English illustrator and caricaturist, born in Leeds. He started to earn his living at 12 and was self-taught in art. After spending several years with a company of wandering actors, he went to London in 1882 and attracted attention by his drawings in *St. Stephen's Review,* and in 1884 went to Australia, where he worked on the Sydney *Bulletin* until 1889. In 1892 he published *The Parson and the Painter,* a series of remarkable sketches. Later his work was produced in the *Daily Graphic, Black and White,* the *Graphic* (for which he traveled in America), and the *Sketch;* and in 1895 he took Du Maurier's place on the staff of *Punch.* By the elimination of every unnecessary line, by a felicitous composition, a high technical excellence in the use of light and shade, keenest observation and unflagging humor, May achieved high rank among celebrated English caricaturists. His specialty

is East London, the types he made famous are the frequenters of the race course, the prize ring, and the stage, and the "guttersnipes," the children of the slums. *Phil May's Gutter-Snipes* (1896), a collection of drawings, contains much of his best work. In these his talent is at its ripest, and the quality of sympathy and kindliness, never lacking in his conception, is especially prominent. Other publications by him are *Phil May's Annual* from 1892 and *Phil May's Sketch Book*, 50 cartoons (1897). *The Phil May Folio*, with a biography of the artist, was published in 1903.

MAY, Samuel Joseph (1797–1871). An American reformer, prominent as an abolitionist in the antislavery struggle. He was born in Boston; graduated at Harvard in 1817; studied for the ministry in the Harvard Divinity School under Dr. Ware; was ordained in 1822; and soon afterwàrd became pastor of the Unitarian Church in Brooklyn, Conn. In 1830 he became a disciple of William Lloyd Garrison and in 1832 joined the first New England antislavery society. When Prudence Crandall (q.v.) was persecuted for opening her school at Canterbury, Conn., to girls of negro blood, he became her friend and champion and later gave her advice and assistance when she was arrested and imprisoned. In the same year, 1833, he was a delegate to the convention at Philadelphia which founded the first American antislavery society and was made one of the vice presidents. In 1834 he resigned his pastorate and became general agent of the Massachusetts Antislavery Society. In October, 1835, while giving a series of lectures in Vermont, May was five times mobbed, once while addressing an audience in the hall of the House of Representatives at Montpelier. The next year he became pastor of the Unitarian Church in South Scituate, Mass., and remained there until 1842, when he took charge for three years of the Girls' Normal School at Lexington, Mass. In 1845 he became pastor of a Unitarian society at Syracuse, N. Y., and continued to hold that position until three years before his death. In 1851 he assisted in the famous rescue of the slave "Jerry," and for this offense against the Fugitive Slave Law he and 17 others were arrested on warrants issued by the United States District Court at Auburn. Anxious to test the question before the courts, May and two other participants in the rescue issued a public declaration to the effect that they had assisted in the rescue of Jerry, that they were ready to stand trial, but would base their defense upon the "unconstitutionality and extreme wickedness of the Fugitive Slave Law." They were, however, never brought to trial. He was one of the conductors of the Underground Railroad. By temperament May was averse to strife and possessed a sunny temper and a gentle disposition, but, being, in his own words, "a Unitarian, a nonresistant, a woman's rights man, an anti-capital-punishment man, and a Garrison abolitionist," it fell to his lot to be engaged in many controversies. The historian Rhodes refers to him as a "rare combination of perfect courage and gentleness of spirit." He published an interesting volume entitled *Some Recollections of our Anti-Slavery Conflict* (1869). Consult Mulford (ed.), *Memoir of Samuel Joseph May* (Boston, 1873; new ed., 1882).

MAY, Thomas (1595–1650). An English historian and poet. He was born at Mayfield, Sussex, England, of an ancient family; graduated B.A. from Sidney Sussex College, Cambridge, in 1612; became a member of Gray's Inn, London, and was admitted to the bar, but, owing to a defect in his speech, did not practice law. He devoted himself to literature and published the tragedies of *Antigone* and *Agrippina*, a comedy entitled *The Heir*, and other works. By special command of Charles I, with whom he was a favorite, he wrote a metrical history of the reigns of Henry II and Edward III. He translated into English verse *Selected Epigrams of Martial*, Vergil's *Georgics*, and Lucan's *Pharsalia*, to the last of which he wrote a continuation in English and Latin. During the Parliamentary troubles he became a Republican. He was secretary to Cromwell during the Civil War and was employed to write its history. Published originally in Latin, and translated into English in 1650, his *History of the Long Parliament* was edited by Baron Masères and translated into French by Guizot (1812; new ed., 1853); and this was followed by *A Breviary of the History of the Parliament of England*, a partisan account of the Civil War. May died Nov. 13, 1650, and was buried in Westminster Abbey, but soon after the Restoration his body was disinterred and thrown into a pit in the adjoining St. Margaret's churchyard.

MAY, Thomas Erskine, Lord Farnborough (1815–86). An English constitutional jurist. He was born in London, Feb. 8, 1815, was educated at Bedford School, became assistant librarian of the House of Commons in 1831, and entered the bar in 1838. In 1844 he published a treatise on the *Law, Privileges, Proceedings, and Usages of Parliament* (10th ed., 1893), which has become a standard authority on parliamentary law and has been translated into French, German, Hungarian, Italian, Spanish, and Japanese. In 1846 he was made examiner of petitions for private bills and the next year he was appointed taxing master to the House of Commons, of which he became clerk in 1871. In 1861–63 he published *The Constitutional History of England since the Accession of George III, 1760–1860.* This learned and impartial work is supplementary to Hallam's. He also published *Democracy in Europe: A History* (1877) and contributed to the *Edinburgh Review*, to the *Law Magazine*, and to other periodicals. He was president of the Statute Law Revision Committee, 1866–84. He resigned the clerkship of the House of Commons in April, 1886, and was created Baron Farnborough, only a few days before his death, at Westminster Palace, May 17, 1886.

MAY, Sir William Henry (1849–). An English admiral. He entered the navy at 14 and passed through the grades of lieutenant (1871), commander (1881), captain (1887), rear admiral (1901), vice admiral (1905), and admiral (1908) to admiral of the fleet in 1913. He was a member of the Arctic expedition of 1875–76; became director of naval ordnance and a lord of the Admiralty in 1901; commanded the Atlantic fleet from 1905 to 1907; was second sea lord in 1907–09; commanded the home fleet for two years; and then was commander in chief at Plymouth from 1911 to 1913.

MAYA, mä'yä. The civilized native race of the peninsula of Yucatan, Mexico, the most important of the cognate peoples constituting the Mayan stock (q.v.). In 1511 a Spanish ship was wrecked off the coast of Yucatan and two of its

men were saved. Grijalva and Cortés made landings at the sacred island of Cozumel in 1518 and 1519. Attempts at conquest, begun in 1526, were not successful till 1541, when Montejo founded Mérida. The country was mapped out into tribute districts; missionaries began to Christianize the natives, and in their zeal destroyed as heathen abominations the native temples and records wherever found. Resistance was crushed out by wholesale massacres and the Maya sovereignty was at an end. The warlike Itzá (q.v.), who had previously retired beyond the Guatemala border, maintained their independence until 1697. In 1848 occurred a general rising throughout the peninsula, the Indians seizing the opportunity afforded by internal troubles in Mexico. Massing their forces in thousands, they took one city after another, burning and destroying everything and consigning to indiscriminate massacre whole garrisons and populations. The entire strength of the Mexican government was invoked to put down the rebellion. The Maya of the northern and central area were finally subdued, while the more determined warriors retired to the difficult region along the southern coast, where they continued to defy the Mexican armies for more than half a century, while maintaining friendly relations with the English of Belize, from whom they obtained their firearms and ammunition. In 1901 the Mexican military force made a determined effort to put down the rebellious Maya and succeeded in capturing their stronghold, Chan Santa Cruz, but owing to covert hostility the eastern part of the Yucatan peninsula north of British Honduras and south of Valladolid is still closed territory. The Lacandones is a small group of Maya who have reverted to the wild and who preserve their pagan religion. The present number of those speaking the Maya language is about 300,000, about one-third of whom are mixed bloods, or persons of European descent who have adopted the language as their own. For general characteristics and archæological history, see MAYAN STOCK; MEXICAN ARCHÆOLOGY.

MAYÁGUEZ, mä-yä′gwäs. The capital of the Department of Mayáguez, and the third largest city in Porto Rico, situated near the west coast, on the Mayáguez River (Map: Porto Rico, A 3). It has a healthful climate, with a mean annual temperature of 78° F. There are three public plazas, and its principal buildings are the city hall, hospital, courthouse, and public market. Its harbor is extensive and well sheltered, but is accessible only to vessels drawing less than 16 feet. It has a system of tramways and is connected with the interior of the island by rail. It is an important commercial centre, coffee being the chief article of trade. Its exports, consisting of coffee, sugar, and oranges, go mainly to the United States. The surrounding district contains sugar estates, coffee plantations, and fruit groves. Adjoining the city is the Porto Rico Agricultural Experiment Station, which was established in 1902. Pop., 1910, municipality, 42,429; urban, 16,591. Mayáguez was established in 1836.

MAYAN (mä′yan) **STOCK.** A group of cognate tribes or nations occupying the states of Vera Cruz, Yucatan, Campeche, Tabasco, and Chiapas, in Mexico, with the greater part of Guatemala and a small portion of Salvador, and exhibiting in their ancient native culture the highest aboriginal development found upon the American continent. The stock includes about 20 languages, some with well-marked dialects. The best-known groups are the Maya proper, who occupy the entire peninsula of Yucatan, the Huaxtec of northern Vera Cruz, the Tzental of Tabasco and Chiàpas, the Mam, Chol, Quiché, Cakchiquel, Pokonchi, and Pokomam of the Guatemalan highlands; and the Chorti, who extend into western Honduras. With the exception of the Huaxtec all of these occupy contiguous territory and were embraced in the sphere of ancient civilization, which, however, seems to have been most highly developed by the Maya tribe proper in the lowland region. It has been estimated that 1,300,000 Indians still speak the Mayan languages. Since the Huaxtec occupy a lone position in the north it has been argued that the entire Mayan stock had a northern origin. Whatever the merits of this argument may be there is no doubt that the most remarkable features of Maya culture were developed in Central America after the separation of the Huaxtec from the main body.

Physically the Mayan peoples are dark, short, broad-headed, and muscular. The different tribes cover a great range of environment from the humid lowlands to the cold mountain heights of the cordillera. Agriculture was their main dependence, corn being the principal crop, to which were added beans, peppers, and cacao, the last, together with bells of copper, being used widely as the ordinary standard of value. Bees were domesticated for their honey and wax. Cotton was spun for clothing and dyed and woven into fabrics which rivaled silk in delicacy. The lands were held in common by each village and were parceled out by the chiefs on a basis of a certain corn production per year to each family. Gold, silver, and copper were used for ornamental purposes, but ordinary metal tools were unknown. The Maya of the coast region had large seagoing canoes, with which they carried on a coastwise trade. Descent was generally in the male line, and each village community was governed by a chief who derived his authority from the hereditary ruler of the tribe or province. Traditions make it clear that more centralized governments once existed. In northern Yucatan there was the League of Mayapan, founded in 960, and on the highlands of Guatemala the Quiché and Cakchiquel had a powerful hold over their smaller neighbors.

The Mayan peoples were remarkable above all other cultured American nations for their architecture, their calendar, and their hieroglyphic system. Of their architecture, as exemplified in the great ruins of Palenque, Uxmal, Mayapan, and Chichén-Itzá, with hundreds of lesser cities and isolated temples scattered through the tangled tropical forests, it is unnecessary to speak at length here. The material was usually a hard limestone, embedded in firm mortar, well cut and exactly fitted, and lavishly carved on every part with mythical and historical figures and hieroglyphic inscriptions. Their hieroglyphic records and rituals were carved or painted upon the walls of their temples and palaces or written in books of folded sheets of maguey paper. The explanation of these hieroglyphs is one of the most important problems in American archæology. In spite of wholesale destruction by the Spanish missionaries and authorities, a few of these ancient sacred books

still remain for study and interpretation, notably the *Codex Troano*, the *Codex Peresianus*, and the *Dresden Codex*, besides a number of others in the Maya language, but in Latin characters, compiled by natives of the Yucatan peninsula later than the Conquest, and usually grouped under the title of "Books of Chilan Balam." Through these books we have been able to connect the ancient dated monuments with our own system of chronology. The Quiché of Guatemala have also their sacred book, the *Popol Vuh*, of which a translation has been made by the Abbé Brasseur de Bourbourg. The calendar system of the Maya, which was practically the same among the neighboring tribes of the same stock, was more elaborate and exact than that of the Aztec tribes. Their year, beginning on July 16, when the sun crossed the zenith, consisted of 365 days, divided into 18 months of 20 days each, the days being grouped into weeks of five days each. At the end of the year there was an interval of five "nameless days" before the beginning of the new year. The years were grouped into *katuns* of 20 years each, the completion of each successive *katun* being signalized by the placing of a commemorative inscribed stone in the wall of the principal temple of the city. In late Maya chronological records the *katuns* are known by the number of the day *ahau* with which they began, and since there were 13 numbers to this day falling in a definite order, the great time cycle was 260 years. A more accurate calendar was used on the ancient monuments in which the *katuns* were recorded in a different manner. All the early dates were calculated from a beginning day and a serial number for each subsequent day was used.

Much attention has been given to the Maya languages, owing to the literary tendency, cultural superiority, and numerical strength of the people using them. Compared with other Indian languages they are comparatively simple in structure. The Maya itself forms one of the few American languages which have enough vitality not only to hold their own but even to force themselves on European settlers and supplant their own speech. In Yucatan whole families of pure white blood are found who known no Spanish, using the Maya exclusively. The earliest Maya grammar is that of Father Villalpando, published about 1555. The first dictionary is also by him, published in 1571. There is also the Maya-Spanish Dictionary of Perez, 1877, with about 20,000 words, and the manuscript Dictionary of the Convent of Motúl, in three large quarto volumes, in the Carter Brown Library of Providence. Great strides have been made in recent years in the study of codices, inscriptions, graphic art, and architecture of the Maya, with the result that the history has been pushed back to before the time of Christ. On the hieroglyphs two excellent studies are the *Commentary on the Dresden Codex* by Förstemann and the *Numerations, Calendar Systems, and Astronomical Knowledge of the Mayas* by Bowditch. The exuberant art passed through a series of remarkable changes, from which the historical sequence has been determined. This sequence is found to agree with the dates carved on the monuments in the Maya system of counting time. On this subject, see *Maya Art* by Spinden and various papers by Morley, explaining the correlation of the calendar with our own time system. The great cities have been separately described in *Memoirs of the Peabody Museum of Harvard University* (Cambridge, Mass., 1904 et seq.), and in the four volumes on archæology by A. P. Maudslay in *Biologia Centrali-Americana* (London, 1899–1902). For a summary of the history, see MEXICAN ARCHÆOLOGY. See also CHICHÉN-ITZÁ; CHILÁN BALÁM; KATUN; POPOL VUH; ARCHÆOLOGY, AMERICAN.

MAY APPLE. A North American perennial herb. See MANDRAKE; PODOPHYLLUM.

MAYBACH, mī'bäg, ALBERT VON (1822–1904). A Prussian administrator, born in Werne, Westphalia. He entered the governmental employ in the department of railroads (1854), of which he became head in 1874, when he urged the control of all railroads by the Empire. The success of this measure and the defeat of the movement for private control in the early 80's was due largely to him. In 1878 he became Secretary of Commerce and in 1879 Secretary of Public Works and President of the Railways in Alsace and Lorraine. He resigned from his executive positions in 1891. From 1882 to 1893 he was a member of the Prussian House of Deputies. Emperor Frederick III decorated him with the cross of the Black Eagle in 1888.

MAY BEETLE. See JUNE BUG.

MAY BIRD, or MAY COCK. The name of several birds which appear in May; especially, among American sportsmen, the knot (q.v.). In New England the black-bellied plover (q.v.) is locally called May cock, but in Great Britain and the southern United States a curlew is meant by this term.

MAY DANCE. A very popular old dance formerly much performed throughout England upon the first of May to celebrate the return of spring. The celebration of May Day with a dance is an old custom, being possibly of Swedish or Gothic origin, but more probably from Roman (its prototypes being the Floralia and the Lupercalia) or Egyptian and Indian sources. In England the dance was a composite one, in which the morris dance (q.v.) played an important part. There was also a milkmaids' dance, and the characters of Robin Hood, Maid Marian, Scarlet, Little John, Tom the Piper, the Hobby Horse, the Lord and Lady of the May, all joined in the various dances which centred around the May pole. See MAY DAY.

MAY DAY (OF., Fr. *mai*, from Lat. *Maius;* connected with OLat. *majus*, great, Lat. *magnus*, Gk. *μέγας*, *megas*, Goth. *mikils*, great Skt. *mah*, to be great). The name popularly given to the first day of May, which among the Germanic and Latin peoples has been associated from an early period with festal ceremonies religious in origin. It was long the custom on this day to start before dawn, make excursions to the woods and fields, and return laden with green flowering boughs. It is plain that this festival, which was celebrated by all classes alike, represented the continuance of an ancient pagan ceremony; and there seems to be reason for regarding it as a survival of rites originally offered to the Roman goddess Maia (q.v.), who was evidently worshiped as the principle and cause of fertility. Although recorded testimony does not enable us to reconstruct the details of her ceremony, it is possible that one essential feature was a ritual marriage to a partner who represented the male element of

growth, whence arose habitual acts of license, which were not repugnant to early moral sentiment. Songs and dances, and performances more or less dramatic in character, which were usual on similar occasions, and are reminiscent of the same spirit, have continued in popular use to our own day, as the familiar English game of children, "Here oats, peas, beans, and barley grows." The actual basis of May Day seems to have been the Roman Floralia, celebrated April 28 to May 3, and instituted at Rome, in the year 238 B.C., on account of a bad harvest. Flora (q.v.), to whom the feast was consecrated, was likewise a fertility goddess, and it may be taken for granted that the elements of her rite were similar to customs which had previously been associated with Maia. Among observances of the Floralia are mentioned gay costumes, dramatic performances, and dances described as frequently indecent. In the mediæval May festival an important feature consisted in a nocturnal expedition to the forest, whence branches were brought and afterward attached to doors. The bushes brought home were planted in the streets, and a lover might thus honor the residence of his mistress. Corresponding to this act of "bringing in the May" (see below), it was usual for the young men of the village to fetch from the wood a tree, the tallest and straightest which could be procured. This was stripped of its boughs, planted in the public green, decorated with garlands and ribbons, painted with gay stripes, and became the centre of dances and games having for the most part an amatory character. The tree thus obtained, as well as the branches of individual celebrants, was called simply "the May"; in England, the white-flowering hawthorn, especially, received this title. A Maypole, once introduced, might remain for many years, and annually be made the focus of popular amusements. With the season continued to be associated theatrical performances. These were frequently of a comic nature, and might be crowded with local jests and personal allusions often of a scurrilous sort, as may be seen from the pastoral of Adam de la Halle, *Le jeu de Robin et de Marion,* composed in the thirteenth century for use on such an occasion. In England the story of Robin Hood (q.v.) was connected with the May games, and the personages of his cycle were introduced into the performances of costumed or masked actors, called morris dancers. (See MORRIS DANCE.) In the Highlands of Scotland and in Ireland the first of May received the name of Beltane (q.v.), and was originally, no doubt, an independent ceremony. Customs analogous to May Day are widespread, in America as well as in Europe. Among the Russians there is a spring festival, celebrated by the boys and girls with a choral dance called Khorovod. (See SLAVONIC MUSIC.) The European springtide feast seems to have come from the Orient, where orgiastic merriment was common in the spring. So in modern India the Holi festival is celebrated in March or April with the singing of songs generally obscene and with the sprinkling with red powder and water or with filth. The naturalistic basis of the custom is joy at the creative impulses felt in the spring and manifested both in the vegetable and the animal world. Hence comes the erotic character of the songs and dances, while the Maypole itself is probably phallic in origin. Consult J. Strutt, *Sports and Pastimes of the People of England* (London, 1801). See PHALLICISM; SPORTS, BOOK OF.

MAYEN, mī′en. A town in the Prussian Rhine Province, Germany, on the Nette, 15 miles west of Coblenz (Map: Germany, B 3). It has a late Gothic church, ancient walls, and a partly preserved castle of the Middle Ages. Cloth, tobacco, hats, oil, basalt, and leather are manufactured, and there is trade in millstones and wine. Pop., 1900, 11,961; 1910, 14,421.

MAYENCE, mȧ′yäns′. A town of Germany. See MAINZ.

MAYENNE, mȧ′ĕn′. A department of northwestern France, traversed by the River Mayenne, a tributary of the Loire (Map: France, N., E 4). It was formerly part of the Province of Maine. Area, 2012 square miles. Its surface is mostly rolling, becoming hilly towards the northeast and culminating in the Mont des Avaloirs. Its fertile soil produces grain, flax, hemp, and apples; there are deposits of coal, iron, marble, and slate. A large number of swine, cattle, and fine horses are reared and dairy goods are produced. Much timber is cut. Pop., 1901, 313,103; 1911, 297,732. Capital, Laval.

MAYENNE. A town in the Department of Mayenne, in the northwest of France, pleasantly situated on the Mayenne, a tributary of the Loire, 19 miles north-northeast of Laval. Its streets are steep, narrow, and crooked; it has an old castle, a twelfth-century church, a school of agriculture, and a museum. It has manufactures of iron, vehicles, calico, and linen, and trades chiefly in horses and grain. Pop. (commune), 1901, 10,125; 1911, 9961.

MAYENNE, DUKE OF. See GUISE.

MAY′ER, ALFRED GOLDSBOROUGH (1868–). An American zoölogist, born at Frederick, Md. He graduated from the Stevens Institute of Technology (M.E., 1889) and from Harvard University (S.D., 1897), where he was an assistant to Dr. Alexander Agassiz from 1892 to 1900 and had charge of the radiates in the Museum of Comparative Zoölogy. He served as curator of natural sciences and curator in chief of the museum of the Brooklyn Institute of Arts and Sciences in 1900–04; was director of the Marine Laboratory of the Carnegie Institution in the Tortugas, Fla., in 1904–05; and was director of the department of marine biology at the Carnegie Institution, Washington, after 1905. He lectured also on biology at Princeton University in 1910–11. At various times he was a member of scientific expeditions to many parts of the world. He is author of *Medusæ of the World* (3 vols., 1910).

MAYER, ALFRED MARSHALL (1836–97). An American physicist. He was born at Baltimore and was educated at St. Mary's College, Baltimore. In 1856 he was appointed professor of physics and chemistry in the University of Maryland and subsequently held positions in the Westminster College in Missouri, in Pennsylvania State College, in Lehigh University, and in the Stevens Institute of Technology. In 1863 he went to Paris, where he spent two years in study and research, working under the famous physicist Regnault. He was for a time one of the editors of the *American Journal of Science* and contributed a number of papers to its pages. In 1872 he was elected a member of the National Academy of Sciences. After assuming the professorship of physics at Stevens Institute (1871) he devoted himself to acous-

tics, in which field he performed many new and interesting experiments and made some valuable discoveries. His most important work in acoustics, perhaps, was the determination of the law connecting the pitch of a sound with the duration of the residual sensation in the ear. To Professor Mayer were also due a method of determining the comparative intensity of sounds with the same pitch, and the location of the organs of hearing in the mosquito. He developed new methods for analyzing sound and he made researches into the nature of electricity, besides being the first to give accurately the temperature correction for tuning forks. An early paper on the *Thermodynamics of Waterfalls* (1869) aroused considerable interest, and one on the variation of the elasticity of metals with change of temperature showed the delicacy of Professor Mayer's experimental work. His last important research was an experimental investigation of the equilibrium of the forces acting in the flotation of disks and rings of metal and their application to measure surface tension. In addition to his scientific attainments Professor Mayer was an enthusiastic sportsman and wrote *Sport with Gun and Rod in American Woods and Waters* (1883). Consult short biographical sketch in *Science*, Aug. 20, 1897, by W. LeConte Stevens. Besides many contributions to scientific journals and encyclopædias, Professor Mayer was the author of *Lecture Notes on Physics* (1868); *The Earth a Great Magnet* (1872); *Light* (1877), with Charles Barnard; *Sound* (1878).

MAYER, Brantz (1809–79). An American author, born in Baltimore, Md. After graduation at St. Mary's College he traveled in the East, practiced law (1829–41), was secretary of the American Legation at Mexico (1843), and wrote his observations there in *Mexico as it Was and Is* (1844); *Mexico, Aztec, Spanish, and Republican* (1851); *Observations of Mexican History and Archæology* (1856); *Mexican Antiquities* (1858)—works that retain some value, especially for the period following the Spanish Conquest. He wrote also *Captain Canot, or Twenty Years of an African Slaver* (1854) and other less important books. Mayer served as paymaster in the Civil War and was a founder of the Maryland Historical Society (1844). He died in Baltimore.

MAYER, mī'ẽr, Johann Tobias (1723–62). A German mathematician and astronomer, born at Marbach in Württemberg. He was self-educated and at first taught mathematics for a living. In 1746 he became connected with a cartographic establishment and gained fame for his improvements in map making. In 1751 he was appointed to the chair of mathematics and astronomy in the University of Göttingen and in 1754 became director of the observatory, where for the remainder of his life he did much to advance the sciences of astronomy and navigation. His first published work was a treatise on curves, which was followed the same year (1745) by his *Mathematischer Atlas*, a sort of résumé of mathematics in 60 tables. At Göttingen he gave much labor to a *Zodiacal Catalogue*, which contains 998 stars and of which a newly computed edition was published by Auwers in 1894. His *Lunar Tables*, published in 1752–53, were so correct as to be adopted by the British Board of Admiralty. In 1760 he invented the repeating circle, which was afterward used with so much success by Borda in measuring the arc of the meridian. His posthumous works include: *Theoria Lunæ juxta Systema Newtonianum* (1767); *Tabulæ Motuum Solis et Lunæ Novæ et Correctæ Quibus Accedit Methodus Longitudinum Promota* (1770); *Observationes Astronomiæ Quadrante Murali Habitæ in Observatorio Goettingensi* (2d ed., 1826). He left a large number of scientific memoirs, which were published by Lichtenberg in 1775.

MAYER, Julius Robert von (1814–78). A German physicist, born in Heilbronn, Württemberg. He attended the Gymnasium at Heilbronn, studied medicine at Tübingen, and finished his university course at Munich and Paris. He made a voyage to Java in 1840 and while there made observations on the blood which led him to the investigation of the subject of animal heat and finally to that of the conservation and correlation of forces. After his return to Heilbronn he practiced medicine there, but after a few years devoted himself almost exclusively to his scientific investigations. He published a preliminary notice of his work up to 1842, in Liebig's *Annalen der Chemie und Pharmacie*, under the title "Bemerkungen über die Kräfte der unbelebten Natur," after it had been refused by Poggendorff's *Annalen* on account of its novel and revolutionary character. It was in this paper that the first announcement was made of the principle underlying the theory of the conservation of energy. In 1845 he made a fuller explanation of the subject in a memoir, under the title *Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel.* In 1848 he published *Beiträge zur Dynamik des Himmels*, and in 1851 the essay for which he is perhaps more generally known in popular science, that upon the mechanical equivalent of heat (*Bemerkungen über das mechanische Aequivalent der Wärme*), in which he developed and expanded the principles laid down in his former papers. This paper it is interesting to note was written about the time of a mental derangement from which he never fully recovered. To Mayer is due the first conception of the doctrine of the conservation of energy, though he was soon followed by Joule and Helmholtz (qq.v.) with investigations and papers on the same subjects. His collected works appeared under the title *Die Mechanik der Wärme* (3d ed., by J. S. Weyrauch, 1893). Consult: Weyrauch, *Robert Mayer* (Stuttgart, 1890); id., *Kleinere Schriften und Briefe von Robert Mayer* (ib., 1893); Gross, *Robert Mayer und Hermann von Helmholtz* (Berlin, 1898); Ernst Jeutsch, *Julius Robert Mayer; seine Krankheitgeschichte und die Geschichte seiner Entdeckung* (Berlin, 1914).

MAY'ERS, William Frederick (1831–78). A Sinologue, born in Tasmania. Educated in Marseilles and proficient in modern languages, at 28 he was appointed student interpreter in China and acted as Vice Consul at Canton and Chifu, becoming in 1872 Chinese Secretary to the British Legation in Peking. He was a master of Chinese, Tibetan, and Korean. He published "The Lamaist Septem in Tibet," in the *Journal of the Royal Asiatic Society* (1869); *The Anglo-Chinese Calendar Manual* (1869); *The Chinese Reader's Manual* (1874), his masterpiece; *The Chinese Government, a Manual of Chinese Titles* (1878); *The Treaty Ports of China* (1867), in collaboration with Dennys and King. He procured for the British Museum one of the few extant copies of the great Im-

perial cyclopædia of Chinese literature in 5020 volumes.

MAY'FAIR. One of the most fashionable sections of London. It lies east of Hyde Park, between Park Lane and Bond Street, and derives its name from a fair formerly held in the locality during May.

MAY'FIELD. A city and the county seat of Graves Co., Ky., 25 miles south of Paducah, on the Illinois Central Railroad (Map: Kentucky, B 6). It controls a large trade in tobacco, having large warehouses and a number of rehandling concerns, and there are flouring, planing, and woolen mills, tobacco and clothing factories, etc. Settled about 1820, Mayfield was incorporated some six years later. The government is administered under a charter of 1893, by a mayor, chosen every four years, and a unicameral council. Pop., 1900, 4081; 1910, 5916.

MAYFIELD. A borough in Lackawanna Co., Pa., about 14 miles northeast of Scranton, on the Delaware and Hudson and the New York, Ontario, and Western railroads (Map: Pennsylvania, K 3). The borough contains a silk mill, but coal mining is the chief industry. Pop., 1900, 2300; 1910, 3662.

MAY'FISH. The most common of American killifish (*Fundulus majalis*). See KILLIFISH.

MAY'FLOW'ER. See ARBUTUS, TRAILING.

MAYFLOWER, THE. A ship of 180 tons' burden, hired to take the Pilgrims from Southampton, England, to the New World in 1620. Some had sailed from Delftshaven in the *Speedwell*, which started with the *Mayflower* but put back after several days. The *Mayflower* arrived at Plymouth December 11, or 21 N. S. (anniversary celebrated December 22).

MAYFLOWER DESCENDANTS, SOCIETY OF. An organization founded in the city of New York Dec. 22, 1894, by lineal descendants of the *Mayflower* pilgrims, "to preserve their memory, their records, their history, and all facts relating to them, their ancestors and their posterity." Every lineal descendant over 18 years of age, male or female, of any passenger of the voyage of the *Mayflower* which terminated at Plymouth, Mass., December, 1620, including all signers of "the Compact," is eligible to membership.

The General Society of Mayflower Descendants was organized at Plymouth, Mass., in 1897. A triennial congress is held in September at Plymouth, Mass. Societies have been organized in New York, Connecticut, Massachusetts, Pennsylvania, Illinois, District of Columbia, Ohio, New Jersey, Wisconsin, Rhode Island, Michigan, Maine, Colorado, California, Washington, and Kansas.

MAY FLY. An insect of the order Ephemerida, sometimes also called shad fly and day fly, the latter, like the scientific name, derived from the ephemeral life of the adult. They have short antennæ, very large fore wings, very small hind wings, absolutely atrophied mouth parts, and two or three long, slender filaments at the end of the abdomen. The transformations are complete and the early stages are passed in the water. The larvæ are active, possess long and strong legs, and breathe by means of tracheal gills. They are found under stones in running streams or swimming among water plants in quiet waters, or they may live at the bottom, more or less covered with slime or mud; some forms also burrow into the sand banks of rivers. They both swim and crawl, and they feed largely upon vegetable matter. The pupa, or nymph, is also active and feeds. It has small wing pads, and when ready to transform it floats at the surface of the water and the subimago issues through the skin of the thorax. The emergence is very rapid, and the subimago flies away almost immediately after the skin cracks. The existence of a subimago stage is peculiar to this order of insects, and there is a subsequent molt after the subimago reaches the shore, the true imago issuing from the skin of the subimago. The May flies differ from all other insects not only in this additional transformation, but also in possessing paired sexual organs which open to the exterior by separate orifices. The life of the adult insect is very short, but the popular idea that they live but a day is erroneous. Curtis kept one alive three weeks. Most species couple during flight, and egg-laying is usually performed in fresh water, where the egg clusters disintegrate and the eggs sink to the beds of the rivers and streams. The larval life lasts from one to three years, and the larvæ form a favorite food for many food fishes. The adults are also eagerly sought for by fish, and many of the artificial flies, especially those forms known as duns, drakes, and spinners (see FLY CASTING), are imitations of May flies. About 300 species have been described—85 from temperate North America. They are strongly attracted to light and fly in enormous numbers, so that they sometimes half fill the globes of electric street lamps with their bodies in a single evening, and greatly trouble lighthouse keepers, especially along the Great Lakes, by swarming about the lantern in such crowds as to obscure the light.

MAYHEM, mā'hĕm (archaic form of *maim*, from OF. *mahaigner*, *mehaigner*, to maim). At common law, the offense of so maiming another, or doing such violence to his members, as to render him the less able in fighting either to defend himself or to annoy his adversary. It renders the wrongdoer liable to a civil action for damages by the injured person and also to a criminal prosecution as "an atrocious breach of the King's peace, and as tending to deprive him of the aid and assistance of his subjects." Destroying or disabling an arm or leg, hand or foot, putting out an eye, or breaking a front tooth, is a mayhem. It is a felony punishable by penal servitude or imprisonment for a term of years. See MAIMING.

MAYHEW, mā'hû, AUGUSTUS SEPTIMUS (1826–75). An English journalist and author, born in London. He wrote in collaboration with his brother Henry such works as *The Greatest Plague of Life, or the Adventures of a Lady in Search of a Good Servant* (1847, illustrated by George Cruikshank), and he joined H. S. Edwards in the production of such farces as *The Goose and the Golden Eggs* (Strand Theatre, 1859); *Christmas Boxes* (Strand, 1860); *The Four Cousins* (Globe Theatre, 1871). From 1848 to 1850 he edited *The Comic Almanac*, to which he had been a contributor since 1845, and his individual productions include *Paved with Gold, or the Romance and Reality of the London Streets* (1857) and *Faces for Fortunes* (3 vols., 1865). See MAYHEW, HENRY.

MAYHEW, EXPERIENCE (1673–1758). A New England divine. He was born in Martha's Vineyard, Mass., the oldest son of Rev. John Mayhew, missionary to the Indians, and great-grandson of Gov. Thomas Mayhew. He began to preach to the Indians at the age of 21, and

had the oversight of five or six Indian assemblies, which he continued for 64 years. Having thoroughly mastered the Indian language, which he had learned in infancy, he was employed by the Society for the Propagation of the Gospel in New England to make a new version of the Psalms and of the Gospel of John, which he did in 1709 in parallel columns of English and Indian. He published *Indian Converts* (1727), comprising the lives of 30 Indian preachers and 80 other converts, besides a volume entitled *Grace Defended*. Consult Hallock, *The Venerable Mayhew and the Aboriginal Indians of Martha's Vineyard*, condensed from Rev. E. Mayhew's *History of Indian Converts* and brought down to date (New York, 1874).—His son, JONATHAN, was distinguished as a preacher and patriot (see MAYHEW, JONATHAN).—Another son, ZACHARIAH, was missionary to the Marthas Vineyard Indians from 1767 to his death, March 6, 1806.

MAYHEW, HENRY (1812–87). An English author, son of a London attorney. From Westminster School he ran away to sea, making a voyage to Calcutta. On his return he was articled to his father for three years. In conjunction with Gilbert à Beckett, he started the *Figaro in London*, a comic weekly (1831–39), and *The Thief* (1832), "a paste and scissors" journal, and was one of the founders of *Punch* (1841). He made a hit with *The Wandering Minstrel*, a one-act farce (1834), which was followed by *But However* (1838), written in conjunction with Henry Baylis. With his brother AUGUSTUS (1826–75) he wrote several clever fictions, as *The Greatest Plague of Life* (1847); *The Good Genius that Turned Everything to Gold* (1847), a fairy tale; *Whom to Marry* (1848); *Living for Appearances* (1855). His most important work was a series of articles in collaboration with John Binny, written to make known the actual condition of the lower classes in London. Originally appearing in the *Morning Chronicle*, they were collected in 1851 under the title *London Labour and the London Poor*. In 1856 the series was continued in monthly numbers with the title *The Great World of London* (completed and published in 1862 as *Criminal Prisons of London*).—His brother HORACE (1816–72) was also a well-known humorist. He wrote farces and tales and was for a time subeditor of *Punch*.

MAYHEW, JONATHAN (1720–66). An American clergyman and patriot of the Revolutionary War, born on the island of Marthas Vineyard, Mass. He graduated at Harvard in 1744, studied theology, and from 1747 until his death was pastor of the West Church (Congregational), Boston. He became one of the best-known preachers in New England and his influence on the political views and theories of the colonists in the pre-Revolutionary period was probably greater than that of any other clergyman. Dr. Mayhew was an ardent believer in the rights of the American Colonies and expressed his views with great boldness from his pulpit. In January, 1750, he preached a sermon on the execution of Charles I, in which he declared that all allegiance was limited by certain inalienable rights that could not be abrogated by the sovereign without giving a corresponding right of abrogation to the subject. His fearlessness led to his being bitterly attacked by the Tories, who charged him, without warrant, with being the instigator of the Boston Stamp Act riots that resulted in the sacking of Governor Hutchinson's house. In May, 1766, he preached a Thanksgiving sermon for the repeal of the Stamp Act that was a remarkable plea for civil and religious liberty. Later in the same year and during a fatal illness he wrote to James Otis (q.v.) a letter which probably contains the earliest suggestion of a union of all the Colonies. The subsequent institution of committees of correspondence undoubtedly had its inception in Dr. Mayhew's plan. His sermons were published separately in pamphlet forms and in collections. Among them were: *Seven Sermons* (1749); *Discourse Concerning Unlimited Submission and Non-Resistance to the Higher Powers* (1750); *Sermons* (1756); *Sermons to Young Men* (1767). Consult Alden Bradford, *Memoir of the Life and Writings of the Rev. Jonathan Mayhew* (Boston, 1838).

MAYHEW, THOMAS (1593–1682). An American Colonial governor. He was born in England and was a merchant in Southampton before he emigrated to America in 1631. He settled in Watertown in 1636 or 1637, obtained in 1641 from the agent of Lord Stirling a grant of Marthas Vineyard and the neighboring islands, and in 1642 became both patentee and Governor of the granted district. His son Thomas having been called to the ministry at Edgartown, Governor Mayhew encouraged his work, both by his advice and by inducing the Indian sachems to govern their people according to the English laws. After his son's death Mayhew continued the ministrations and organized an Indian church. For 40 years while he lived among them the English and Indians were at peace. He died in Marthas Vineyard March 25, 1682. Consult C. E. Banks, *The History of Martha's Vineyard* (Boston, 1911).

MAY LAWS. The name applied to a series of laws enacted by the Prussian Diet in May, 1873, marking the opening of the conflict between Church and state generally known as the Kulturkampf (q.v.).

MAYNA, mī'nȧ, or **MAINA.** A group of tribes constituting a distinct linguistic stock, upon the Upper Marañon (Amazon) between the Santiago and Pastaza rivers on the Peru-Ecuador frontier. Their language is particularly harsh and difficult. A part were gathered in missions during the eighteenth century, but the majority are still wild and unsubdued, living by hunting and fishing. The name is also frequently used collectively to include all the tribes of the Ucayali and Huallaga region, the former Peruvian Province of Maynas.

MAY'NARD. A town in Middlesex Co., Mass., 28 miles by rail west by north of Boston, on the Assabet River and on the Boston and Maine Railroad (Map: Massachusetts, E 3). The town is engaged chiefly in the manufacture of woolen goods. The water works are owned by the municipality. Pop., 1900, 3142; 1910, 6390.

MAYNARD, EDWARD (1813–91). An American dental surgeon and inventor, born at Madison, N. Y. He entered the United States Military Academy in 1831, but resigned and took up the profession of dentistry, which he practiced from 1836 to 1890, at Washington. His contribution to the profession included many improvements in operative methods, especially in the filling of teeth. He became a member of the faculty of the Baltimore College of Dental Surgery and of George Washington University. It is

with improvements in the construction of firearms, however, that his name is usually associated, his first important invention (1845) being a system of priming which practically superseded the percussion cap. In 1851 he patented a breech-loading rifle, afterward known as the Maynard rifle, and five years later adapted it to the use of the metallic cartridge. In 1860 he patented a method of converting muzzle-loaders into breechloaders. He was granted the Great Medal of Merit of Sweden.

MAYNARD, mā′nàr′, François de (1582–1646). A French poet, born at Toulouse. In 1618 he became president of Aurillac. In 1634 he went to Italy with the Ambassador, De Noailles, but soon quarreled with him. One of the first members of the French Academy, he took little part in its deliberations, since he was practically exiled from Paris by Richelieu. For the wife of Henry IV, Margaret of Valois, to whom he was secretary, he wrote his early poems. He was a disciple of Malherbe (q.v.) and in workmanship excelled Racan (q.v.), although he lacked the power of the latter. In literature he stands between these two. His sonnets, odes, and epigrams were first published as a collection by Gomberville in 1646.

MAY′NARD, George Willoughby (1843–). An American mural, figure, and marine painter, born in Washington, D. C., the son of Edward Maynard. He studied at the National Academy of Design, New York, and at the Royal Academy of Antwerp, under Van Terins and De Keyser, from whom he acquired great thoroughness of workmanship. In 1878 he opened a studio in Paris; later he settled in New York City. He was elected to the National Academy of Design in 1885 and became a member of the Society of American Artists and of the American Water Color Society. Maynard early devoted himself to decorative painting, and his work may be seen in the Congressional Library at Washington, D. C., in the Appellate Court of New York City, in the Bijou Theatre, Boston, the Metropolitan Opera House, New York (ceiling), and the Essex County Courthouse, Newark, N. J. The brass inlay work in the floor of the entrance hall of the Boston Public Library and in the entrance hall of Columbia University Library, New York, is also by him. Among his best-known canvases are: "Vespers at Antwerp" and "1776," sent to the Centennial Exhibition of 1876; "Venetian Court"; "An Ancient Mariner" (1883); "Strange Gods"; "The Surf" (1904); "The Oceanides" (1911); "Rocks at Ogunquit" (1912); "Flood-Tide" (1912). His Pompeian decorations in the Agricultural Building at Chicago in 1893 were perhaps the most effective in the Exposition Buildings. The Metropolitan Museum in New York possesses his "In Strange Seas" and he is also represented in the collections of the Pennsylvania Academy, the Providence Museum, and the Corcoran Gallery, Washington.

MAYNARD, Horace (1814–82). An American politician, born in Westboro, Mass. He graduated at Amherst College in 1838 and shortly afterward removed to Knoxville, Tenn., where for some years he was a tutor and then professor of mathematics and natural history in the East Tennessee College. In 1845 he became a lawyer and in 1857 was elected by the "Americans" (see American Party and Know-Nothings) to Congress, where he continued to sit until 1863. Like Andrew Johnson, W. G. Brownlow, and others, Maynard strove hard but unsuccessfully to keep Tennessee in the Union, and because of his loyalty suffered exile and loss of property. He returned to Tennessee after its occupation by Federal troops and became Attorney-General of the State in 1864. He was again a Representative in Congress from 1866 to 1875, was Minister to Russia from 1875 to 1880, and was Postmaster-General in President Hayes's cabinet from August, 1880, to March, 1881.

MAYNARD, Sir John (1602–90). An English constitutional lawyer. He was born at Tavistock, England, and was educated at Exeter College, Oxford. After the regular course of study in the Middle Temple he was called to the bar in 1626; he had been elected a member of Parliament in the previous year. He was subsequently made a sergeant at law and King's sergeant, but declined the place on the bench offered him by Charles II in 1660. While an advocate for increasing the power of the people, he never concurred in the extreme views taken by the radical Republicans, and, although an earnest Presbyterian, stood aloof from the fanaticism of many in his party. He was active in the prosecution of Strafford and Laud, but opposed the arbitrary power assumed by the army and Cromwell's evident intention of making himself King in fact, if not in name; for the position he took in this respect he was, in 1647, expelled from the House of Commons and imprisoned in the Tower, and in the following year he was fined £500 for refusing to kneel at the bar of the House of Lords. At the Restoration the honor of knighthood was conferred upon him by Charles II. His political course under that monarch was judicious and conservative. In the time of the revolution and the accession of William and Mary he showed ability, notably in the great conference held between the House of Lords and the Commons in regard to the abdication of James II, a measure which he strenuously advocated. In the same year, 1689, he was made Commissioner of the Great Seal. A number of his political speeches and legal decisions have been printed in various collections. His manuscript collections in 87 volumes are preserved in Lincoln's Inn Library. He died at Gunnersbury Manor.

MAYNE, Jasper (1604–72). An English dramatist and divine, educated at Westminster School and at Christ Church, Oxford (B.A., 1628; M.A., 1631). While at the university he wrote considerable occasional verse. To him has been ascribed, on very doubtful grounds, the beautiful eulogy signed I. M. S. prefixed to the second folio of Shakespeare's works (1632). He afterward wrote verses in honor of Ben Jonson and Beaumont and Fletcher. His two plays are the *City Match*, a comedy (printed 1639), and *The Amorous War* (printed 1648), a tragicomedy, containing the quaint lyric beginning "Time is a feathered thing" (reprinted in *The Oxford Book of English Verse*, A. T. Quiller-Couch, Oxford, 1900). In 1638 he began a translation of Lucian's *Dialogues* (printed 1664), afterward completed by Francis Hicks; and for Donne's *Paradoxes* (1652) he translated several Latin epigrams. During the Civil War he lived mostly at Oxford, where he frequently preached before the King. After the Restoration he was appointed a canon of Christ Church and archdeacon of Chichester. He died at Oxford, Dec. 6, 1672.

MAYNOOTH, mā-nōōth′. A village of Kil-

dare, Ireland, west of Dublin, having a population of less than 1000 (Map: Ireland, E 5). It was the seat of the Geraldines, the ruins of whose castle remain. It was of importance in the rebellions of the Irish in the reign of Henry VIII and in the time of the civil wars and the Commonwealth. It is chiefly known now as the site of the Roman Catholic College of St. Patrick, opened in 1795. There have been 600 students in attendance, about 100 entering each year, all candidates for the priesthood, and more than half supported by funds for that purpose. Consult T. Healy, *Maynooth College: Its Centenary History* (Dublin, 1895).

MAYO, mā'ō. A maritime county of the Province of Connaught, Ireland, bounded north and west by the Atlantic Ocean; east by Sligo and Roscommon, and south by Galway (Map: Ireland, B 4). Area, 2156 square miles. The picturesque coast line is about 250 miles long, with harbors at Westport and Newport. There are many islands off its coasts. The surface is very irregular, with cliffs and mountains in the north and west and a hilly plain in the east. The highest point is Mweelrea (2688 feet). The chief stream is the Moy. The chief industry is cattle raising; fisheries, linen and woolen manufactures are also carried on. The capital is Castlebar. Pop., 1901, 199,166; 1911, 192,177.

MAYO, mä'yō. A tribe upon the river of the same name in Sonora, Mexico. They and the Yaqui (q.v.), their northern neighbors and allies, speak dialects of the same language, commonly called Cahita, and possibly belonging to the Piman linguistic stock. In physical characteristics and habits the two tribes are practically identical. The Mayo cultivate corn, cotton, squashes, beans, tobacco, and maguey, from which last they manufacture mescal. Their houses are light structures of cane and boughs, covered with palm leaves. They are now very much Mexicanized and number perhaps 7000. See PIMAN STOCK.

MAYO, mā'ō, AMORY DWIGHT (1823–1907). An American clergyman and educator. He was born at Warwick, Mass., was educated at Amherst College, and studied theology with the Rev. Hosea Ballou. At first a Universalist, between 1846 and 1872, he was pastor of churches in Gloucester, Mass., Cleveland, and Albany, and later of Unitarian churches in Cincinnati, Ohio, and Springfield, Mass. Afterward he devoted himself largely to educational work in the South, although from 1868 to 1898 he was professor or lectured periodically in the Meadville (Pa.) Theological School. A number of his reports were published by the United States Bureau of Education.

MAYO, CHARLES HORACE (1865–). An American surgeon. He was born at Rochester, Minn., studied at Northwestern University, graduated from the Chicago Medical College in 1888, and thereafter practiced at Rochester, where he became surgeon of St. Mary's Hospital. He served as president of the Minnesota State Medical Society (1905) and of the Western Surgical and Gynæcological Society (1904) and also as chairman of the surgical sections of the American Medical Association (1907) and the International Tuberculosis Congress (1908). Charles Mayo became known especially for his success in operations for various forms of goitre. With his brother William J. (q.v.) he published *A Collection of Papers Published Previous to 1909* (2 vols., 1912). Subsequently appeared in medical journals and later in reprints: *Intrathoracic Goitre, with Report of Cases* (1910); *The Prophylaxis of Cancer* (1910); *Surgery of the Thymus Gland* (1912).

The father of Charles and William Mayo, WILLIAM WORRALL MAYO (1820–1911), was born near Manchester, England, but came early to the United States. He was educated at the University of Missouri and at the College of Physicians and Surgeons, New York, where he graduated in 1854. He was one of the pioneer surgeons of the Northwest, with his practice established at Rochester, Minn.

MAYO, FRANK (1839–96). An American actor, best known for his long-continued popularity in the backwoods character of Davy Crockett. He was born in Boston. Early in life he went to San Francisco, where at 17 he began his career and within a few years was appearing with the young Edwin Booth. In 1863 he became a leading man in San Francisco and in 1865 in Boston. He won applause as Othello, Hamlet, Ferdinand in *The Tempest*, and in other classic rôles, but greater success with the public as Badger in *The Streets of New York*, till in 1872 he brought out *Davy Crockett*. Among his later productions were his own dramatizations of *Nordeck* and of Mark Twain's *Pudd'nhead Wilson*, the latter a character well suited to display his peculiar gifts as a comedian.

MAYO, HENRY THOMAS (1856–). An American naval officer, born at Burlington, Vt. He graduated from the United States Naval Academy as a midshipman in 1876 and was promoted to ensign, 1878; lieutenant (junior grade), 1885; lieutenant, 1890; lieutenant commander, 1899; commander, 1905; captain, 1908; rear admiral, 1913. During the early part of his career he served on the *Kearsarge* (original), *Monocacy*, and *Tennessee* on the Asiatic Station; in the Coast Survey; on the *Jamestown*, *Bennington*, and *Thetis* on the Pacific coast; on the *Bennington* (navigator) during the Spanish-American War; and as executive officer of the *Wisconsin* in 1901–04. In 1907–08 he commanded the cruiser *Albany* and in 1909–11 the armored cruiser *California*. He was Lighthouse Inspector of the Twelfth District (1905–07); Secretary of the Lighthouse Board (1908–09); and commandant of the navy yard, Mare Island (1911–13). In 1913 he became aid for *personnel* to the Secretary of the Navy. Shortly after his promotion to rear admiral he was ordered to command a division of the North Atlantic fleet and in 1915 was still serving in that capacity. While senior officer of the force off Tampico, Mexico, in April, 1914, a boat's crew of the *Dolphin*, one of the vessels under his command, was seized by Mexican soldiers. (See MEXICO, *History;* UNITED STATES, *History.*) Admiral Mayo's prompt and decisive action at this time won him official praise and general approval. He was the first, under a new law, to be made vice admiral (1915).

MAYO, JOHN. See MAYOW, JOHN.

MAYO, RICHARD SOUTHWELL BOURKE, sixth EARL OF (1822–72). An English statesman. He was born in Dublin, Ireland, was educated at Trinity College there, afterward traveled in Russia, and published an account of his trip, entitled *In St. Petersburg and Moscow* (2 vols., 1846). From 1847 to 1869 he was a member of Parliament and from 1852 to 1869 was Chief Secretary for Ireland. In January, 1869, by Disraeli's appointment, he became Governor-

General of India, in which capacity he introduced extensive and careful reforms in the conduct of the public service and was an efficient and successful administrator. While inspecting the penal settlement at Port Blair, Andaman Islands, he was killed by one of the convicts. Consult Sir W. W. Hunter, *Life of the Earl of Mayo* (London, 1875), and *The Earl of Mayo*, in the "Rulers of India Series" (Oxford, 1892).

MAYO, William James (1861–). An American surgeon. Born at Le Sueur, Minn., he graduated M.D. from the University of Michigan in 1883, became a practicing surgeon at Rochester, Minn., and served with his brother, Charles Horace Mayo (q.v.), as surgeon of the Mayo clinic of St. Mary's Hospital. He became first lieutenant in the United States Medical Reserve Corps and regent of the University of Minnesota. He was president of the Minnesota State Medical Society in 1895, of the American Medical Association in 1906 (chairman of the surgical section in 1899), and of the American Surgical Association in 1913–14. William Mayo became known as an especially successful operator in cases of gallstones, cancer, and diseases of the intestinal tract. His papers up to 1909 appeared in the collection mentioned in the article on his brother Charles. Later ones, important in medical literature, include: *Gastro-jejunostomy* (1911); *Removal of the Rectum for Cancer: Statistical Report of 120 Cases* (1911); *Jejunostomy* (1912); *Surgery of the Spleen* (1913).

The world-wide fame of the Mayo brothers as operators rests not only on their skill, but also upon the development of their clinic, where they surrounded themselves by a staff of physicians and nurses recognized as leaders, each in his specialty. The clinic is annually visited by about 3000 physicians, many of whom take post-graduate courses. In 1914 more than 10,000 operations were performed. Every detail is studiously considered, and the careful notes taken appear yearly in *Collected Papers by the Staff of St. Mary's Hospital, Mayo Clinic, Rochester, Minnesota* (Philadelphia, 1910 et seq.). Consult G. W. Broome, *Rochester and the Mayo Clinic* (New York, 1914).

MAYO, William Starbuck (1812–95). An American novelist and traveler. He graduated from the New York College of Physicians and Surgeons (1833), traveled widely in little-explored regions, and first won notice in fiction by *Kaloolah* (1849), a romance of Central Africa. This was followed by *The Berber*, a story of the mountaineers of the Atlas (1850, 1883); *Romance Dust from an Historic Placer*, a collection of short stories (1851); *Never Again* (1873). Mayo's novels are strong in narration, good in plot, weak in character.

MAYÓN, mä-yōn′, or Albay. An active volcano and the highest peak in Luzon, Philippine Islands. It is situated in the Province of Albay, near the southeast extremity of the island (Map: Philippine Islands, D 4). It is a majestic cone, rising from the seashore to a height of 7916 feet, and capped by a white cloud of smoke which in the night assumes a fiery glow. Its sides are covered with grass and moss, and though apparently smooth and unobstructed, the mountain is very difficult of ascent. There have been a number of eruptions during the past century, in which the mountain emitted great quantities of lava, cinders, and incandescent rocks. The eruption of 1814 destroyed the old town of Cagsaua, with a loss of 1200 lives; and the last great eruption in 1897 emitted volumes of lava and ashes, the latter covering an area 75 miles in radius.

MAYOR, mā′ẽr (from Lat. *major*, greater, comparative of *magnus*, great). The chief executive officer of a municipal corporation. In England the mayor was originally a steward, bailiff, or overseer. Later he became the chief magistrate of a corporate town. During the reign of John the right of formally choosing their mayor was conceded to the barons of London, the election being subject to the approval of the King. During the same reign the other large towns were allowed to have mayors. The mayors of the cities of York, Dublin, and London bear the title of Lord Mayor. The Lord Mayor of London, whose jurisdiction extends only to the ancient inner city, is chosen annually from among the aldermen, practically by the liverymen of the guilds. His chief duty is to sustain the hospitality of the city, for which purpose he receives an allowance of £8000 a year, together with the use of the mansion house. The ordinary English mayor is elected by the municipal council, usually from among the aldermen, for a term of one year. He is an *ex officio* justice of the peace and usually serves as a returning officer. In France there is a mayor (*maire*) at the head of each commune, elected by the municipal council from among its own members. He serves during the term of the council. In the Germanic countries the mayor or burgomaster is usually a highly trained professional officer with more or less experience in the municipal service, and is frequently called to the headship of a larger municipality after having gained a reputation as mayor of a smaller town. He is elected by the city council for a long term, often for life. The prevailing method of selecting mayors in the larger countries of Europe is election by the municipal council. In Belgium, Denmark, Holland, Norway and Sweden, and in Italy, so far as the larger towns are concerned, the method of appointment is by the central government.

In the United States the office of mayor existed from the earliest Colonial times, being taken over as a part of the English municipal system. At first the mayor was usually appointed by the Governor, and was generally a member of the municipal council. Later he was excluded from the council and then came to be chosen by the council, although occasionally, as in the city of Boston, he was elected by popular vote from the beginning. This is now the rule in the United States almost without exception. The term of the mayor in the United States varies from one year to five, the usual term being two years. Everywhere in Europe the mayor acts as the local agent of the central government and consequently is often subject to disciplinary control by the central government. Thus, the French mayor may be suspended by the prefect for one month, by the Minister of the Interior for three months, and may be permanently removed by the President; a somewhat similar rule prevails in other continental states. In several American States the mayor may be removed by the Governor for cause, subject to the power of the courts to determine what shall constitute just cause in a given case. Besides his duty as agent of the central government the mayor is the official head of the municipal corporation. His powers are much larger in some

countries than in others. In the United States there is a marked tendency of late years towards increasing the power of this officer and making him chiefly responsible for the good government of the city. See sections *Local Government* in the various countries mentioned. Consult G. J. Bayles, *Office of Mayor in the United States: A Study in Administrative Law* (New York, 1895). See MUNICIPALITY.

MAY'OR, JOHN EYTON BICKERSTETH (1825–1910). An English classical philologist, brother of J. B. Mayor, born at Baddagama, Ceylon. He graduated from St. John's College, Cambridge (1848), and was appointed fellow in 1849; from 1849 to 1853 he was assistant master at Marlborough College. In 1853 he became lecturer at St. John's College, Cambridge. Of this university he was librarian from 1863 to 1867, and in 1872 he was made professor of Latin there. He became president of his college in 1902. Mayor became best known as editor of *Thirteen Satires of Juvenal* (2 vols., 1853; 3d ed., 1881); the chief feature of this work is its array of illustrative quotations. He also edited some of Cicero's works, especially the *Second Philippic*, Homer's *Odyssey*, books ix–xii, Pliny's *Letters*, book iii, and was the author of many other works relating to the classics, the history of education, and the Church. For a time he was one of the editors of the *Journal of Philology*. For a notice of his career, by J. E. Sandys, consult *The Classical Review*, vol. xxv (London, 1911).

MAYOR, JOSEPH BICKERSTETH (1828–). An English classical scholar, brother of J. E. B. Mayor. He was educated at Rugby and at St. John's College, Cambridge, where he graduated B.A. in 1851. After some years as fellow and lecturer he was ordained a priest in the Established church. From 1863 to 1868 he was head master of Kensington Proprietary School and in 1870 became professor of classics in King's College, London. This post he resigned in 1879. Mayor had married in 1863 a niece of the historian George Grote, and became his literary executor, editing his posthumous essays on philosophy. His other works include an edition of Cicero, *De Natura Deorum* (3 vols., 1880–85); a valuable bibliography entitled *A Guide to the Choice of Classical Books* (four editions, 1880–96); *Ancient Philosophy*, a convenient sketch (1881); *Chapters on English Metre* (1886; 2d ed., 1901); *Handbook of Modern English Metre* (1903); *The World's Desire, and Other Sermons* (1906); *Select Readings from the Psalms, with an Essay on the Growth of Revelation* (1908). He also published editions, with introduction, notes, etc., of: *The Epistle of St. James* (3d ed., 1910; with additions, 1913); Clement of Alexandria's *Stromateis*, book vii, based on Hort's notes (1902); *The Epistle of St. Jude and Second Epistle of St. Peter* (1907). From 1887 to 1893 Mayor edited the *Classical Review*.

MAYORGA, mä-yôr'gä, MARTÍN DE (c.1715–83). A viceroy of Mexico. After having been dubbed a knight of Alcántara and appointed field marshal of the royal army, captain of the Spanish Royal Guards and Governor of Alcántara in Estremadura, he was in 1773 appointed Governor of Central America. In 1779, on the death of Bucareli, he was made forty-seventh Viceroy of New Spain. While he was in power there broke out an epidemic of smallpox, to arrest which he made great exertions. He founded an academy of arts in Mexico, and sent to the royal archives of Spain for publication copies of the manuscripts of the historian Veytia. His attitude towards foreign encroachment was vigorously defensive.

MAYOR (mā'ẽr) **OF THE PALACE.** See MAJOR DOMUS.

MAYORUNA, mä'yô-rōō'nä. A fierce and savage tribe of Panoan stock (q.v.) living south of the Marañon (Amazon), between the Ucayali and Javari rivers, northeastern Peru. They are supposed to have lived formerly farther to the west and to have been driven into the forest by the Inca conquest. From the frequency of beards and light skins among them, traditionally due to admixture of Spanish captive blood, they are sometimes called *Barbados* (bearded) by the Spaniards. They live by hunting and keep to the forests, seldom coming down to the rivers, being at war both with all the other tribes and with the whites. Their weapons are spears, clubs, and blowpipes, and they are famous for their powerful blowgun poison. They are tall and well formed, go perfectly naked, and cut their hair across the forehead, letting it fall loosely down behind.

MAYO-SMITH, RICHMOND (1854–1901). An American economist and educator, born at Troy, Ohio. He was a brother of Henry Preserved Smith (q.v.), Mayo being his mother's maiden name. He graduated at Amherst in 1875 and then studied for two years at Berlin and Heidelberg. Between 1877 and 1883 he was assistant and adjunct professor of history and political science at Columbia University; afterward he held the chair of political economy and social science. In his researches he devoted himself especially to statistics, a field in which he became an authority. He was an editor of the *Political Science Quarterly*, vice president of the American Statistical Association (1897 to his death), and one of the founders of the American Economic Association. His publications include: *Emigration and Immigration* (1890); *Sociology and Statistics* (1895); *Statistics and Economics* (1899).

MAYOTTE, mä-yŏt'. One of the Comoro Islands (q.v.).

MAYOW, mā'ô, JOHN (1643–79). An English chemist and physiologist, born in London. He studied law and medicine at Oxford and practiced medicine at Bath, but devoted himself specially to research in chemistry and physiology and is chiefly known for his ingenious speculations concerning the process of combustion, in which he anticipated, to some extent, the ideas which have since been induced from the discoveries of Priestley, Lavoisier, and others. His principal publication was *Tractatus quinque Medico-Physici* (1674). It appeared under the title *Opera Omnia Medica Physica* in 1681, and was translated into Dutch (1684), German (1799), French (1840), and English (1907). His work in anatomy and physiology, especially on the subject of muscular action and on respiration, was also important.

MAY'POP. The fruit of a passion flower (q.v.).

MAYR, mīr, GEORG VON (1841–). A German economist, born in Würzburg. He studied at Munich, where he became professor in 1868; was appointed in 1879 Undersecretary to the ministry for Alsace-Lorraine; retired in 1887, and became docent (1891) and professor (1895) in the University of Strassburg. In 1898 he was called to Munich. He was rector of this university in 1913–14. He founded the

Zeitschrift des bayrischen statistischen Bureaus (1869) and *Das allgemeine statistische Archiv* (1890) and wrote: *Die Gesetzmässigkeit im Gesellschaftsleben* (1877); *Zur Reichsfinanz-Reform* (1893); *Statistik und Gesellschaftslehre* (1895–97); *Die Pflicht im Wirtschaftsleben* (1900); *Flotte und Finanzen* (1900); *Grundriss zu Vorlesungen über praktische Nationalökonomie* (1900 et seq.); *Zolltariffentwurf und Wissenschaft* (1901); *Die Bevölkerung Britisch-Indiens* (1907).

MAYR, or **MAYER**, Johann Simon (1763–1845). A German-Italian dramatic composer, born at Mendorf, Bavaria. His father was a musician, and the boy studied under him and at a Jesuit seminary at Ingolstadt, and later under Lenzi at Bergamo, Italy, where he settled permanently. In 1791 an oratorio, *Jacob a Labano Fugiens*, was so successful that he was commissioned to write three more, and in 1794 he produced his first opera, *Saffo, ossia i riti d'Apollo Leucadio*. During the next 20 years he wrote about 70 operas, which were only surpassed in popular favor by those of Rossini. In 1802 he became chapelmaster at Santa Maria Maggiore in Bergamo, and while there refused the offers of posts at London, Paris, Dresden, and Milan. He was also professor of composition in the music school of Bergamo, and Donizetti was one of his pupils. His best operas were: *Lodoïska* (1795), *Ginevra di Scozia* (1801), *Media* (1812), and *Rosa bianca e Rosa rossa* (1814). He was blind for a number of years before his death, which occurred at Bergamo. In 1852 a monument was erected to his memory in that city. Consult H. Kretzschmar, *Die musikgeschichtliche Bedeutung Simon Mayrs* (Leipzig, 1904).

MAY SUCKER. A fish. See Cutlips.

MAYS'VILLE. A city and the county seat of Mason Co., Ky., 63 miles southeast of Cincinnati, Ohio, on the Ohio River, and on the Chesapeake and Ohio and the Louisville and Nashville railroads (Map: Kentucky, G 2). It has the Maysville and Mason County Public Library, incorporated in 1878, a fine Federal building, County Historical Association, Wilson Memorial Hospital, and Beechwood Park. There are important commercial interests, the city being the centre of a rich agricultural country, and its industries are represented by cotton mills, ice factories, flour, saw, and planing mills, foundries, distilleries, cigar, chewing-tobacco, furniture, and shoe factories, pressed-brick plants, and plow and pulley works. Settled as early as 1784, Maysville was incorporated as a town by the Virginia Legislature in 1787, and was chartered as a city in 1833, becoming a fourth-class city 60 years later. In 1848 it was made the county seat. Pop., 1900, 6423; 1910, 6141.

MAYUMO, San Miguel de. See San Miguel de Mayumo.

MAYUR PANDIT. See Marathi.

MAY'WEED (older Eng. *maieweed*, variant of *maytheweed;* influenced by popular etymology with *May*, the fifth month), Dog Fennel (*Anthemis cotula*). A plant of the family Compositæ, growing in pastures and meadows. It is a native of Europe, but, although widely spread in America, it is not an aggressive weed.

MAY'WOOD. A village in Cook Co., Ill., on the Des Plaines River, 11 miles by rail west of Chicago, on the Chicago Great Western, the Chicago and North-Western, and the Indiana Harbor Belt railroads (Map: Illinois, J 2). The most important industries of the village are the manufacture of tin plate and cans and lithographing. Maywood contains the Logan Home, the Baptist Old People's Home, the German Lutheran Theological Seminary, the Chicago Theological Seminary, Kittie Smith Home for Crippled Children, and Library Hall. The water works are owned by the municipality. Pop., 1900, 4532; 1910, 8033; 1914 (U. S. est.), 9783; 1920, 12,072.

MAZADE, mȧ'zȧd', Charles de (1820–93). A French publicist, born at Castel-Sarrazin (Tarn-et-Garonne). He studied law at Toulouse and afterward became a contributor to the French press. He became one of the contributors to the *Revue des Deux Mondes* (1846), and from 1852 to 1858 and again from 1865 until his death directed its department of politics. His publications include: *L'Espagne contemporaine* (1855); *L'Italie moderne* (1860); *La Pologne contemporaine* (1863); *L'Italie et les Italiens* (1864); *Lamartine, sa vie littéraire et politique* (1872); *La guerre de France* (1875); *Le comte de Cavour* (1877); *M. Thiers: cinquante années l'histoire contemporaine* (1884); *Un chancelier l'ancien régime: le règne diplomatique de M. de Metternich* (1889); *L'Europe et les neutralités* (1893); *L'Opposition royaliste: Berryer, De Villèle, De Falloux* (1894); and he edited the *Correspondance du maréchal Davout* (1885).

MAZAGAN, mȧ'zȧ-gän'. A seaport of Morocco, Africa, situated on the Atlantic coast, about 110 miles north of the city of Morocco, of which it is the port (Map: Africa, D 1). It is strongly fortified and is the centre of a brisk trade in agricultural products, fruit, and wool. The imports in 1912 amounted to $2,600,000 and the exports to $2,400,000, but 80 per cent of the trade is with France and Great Britain, the chief exports being wool, hides, corn, beans, and wax. The settlement was founded by the Portuguese in 1509, and numerous old houses of European design still remain. They abandoned the city in 1769 to found a new colony in Brazil. The population is estimated at 14,000, including a number of European merchants and consular agents, and the Jewish inhabitants constitute a quarter of the population.

MAZAMET, mȧ'zȧ'mȧ'. A town in the Department of Tarn, France, situated on the north slope of the Black Mountains about 50 miles east-southeast of Toulouse (Map: France, S., G 5). It is noted for its extensive manufactures of cloth, flannel, clothing, hosiery, and leather. Pop. (commune), 1901, 13,978; 1911, 14,764.

MAZANDERAN, mä'zȧn-de-rän'. A province of northern Persia, south of the Caspian Sea, bounded respectively east, south, and west by Astrabad, Irak-Ajemi, and the Elburz Mountains and Gilan (Map: Asia, Central, D 4). It is about 200 miles long by 50 miles broad, with an estimated area of 10,000 square miles. The surface is low and swampy near the Caspian Sea, covered partly with jungle. This part is watered by numerous small streams and is malarial. The land rises towards the south and culminates in Demavend (19,400 feet). The chief minerals are iron ore and petroleum and its by-products. The ground in many parts is swampy, but fertile, and rice, cotton, sugar cane, fruit trees, and the mulberry for the silk industry are largely cultivated. Fishing is an important industry, as also is grazing, horses, cattle, sheep,

and goats being raised in great numbers. There is a considerable export trade with Russia of silk and agricultural products, the imports being cotton and woolen goods, cutlery, and tobacco. Pop. (est.), 200,000. Capital, Sari.

MAZANDERANI, mä'zän-de-rä'nē. The natives of Mazanderan, or Taberistan, in northern Persia, on the Caspian Sea. They speak a dialect of Persian which, like the speech of the neighboring Province of Ghilan, has peculiarities justifying its classification as a special form of the Persian tongue. The Mazanderani are of smaller stature than the people of the highlands, well proportioned, with regular features, bushy eyebrows, and abundant hair.

MAZARA. See MAZZARA DEL VALLO.

MAZARIN, mȧ'zȧ'răn', JULES (1602–61). A Cardinal and Prime Minister of France during the minority of Louis XIV. He was born July 14, 1602, at Piscina in the Abruzzi, Italy, his father being intendant of the household of Philip Colonna. He was educated in the Jesuit College at Rome, and later accompanied Jerome Colonna to the Spanish University of Alcalá, where he studied law, but also indulged in gambling and love-making—practices which were continued at Salamanca. On returning to Rome Mazarin became a doctor of canon and civil law and entered the Pope's military service as a captain of infantry in the Colonna regiment. His talents, however, were more diplomatic than military, and after being employed on several political missions in Italy he accompanied the Papal Legate to the court of France and there, about 1628, became known to Richelieu, who perceived his peculiar talents and engaged him to maintain the French interests in Italy. This he did while still employed by the Pope as Vice Legate to Avignon (1632) and Nuncio to the French court, an office to which he was appointed in 1634. The Spaniards complained of his partiality for France, and the Pope was obliged to recall him. In 1639, however, he openly entered the service of Louis XIII, was naturalized a Frenchman, and in 1641 received a cardinal's hat, through the influence of Richelieu, who, when dying, recommended Mazarin to the King as the only person capable of carrying on his political system. Mazarin's position was one of great difficulty amid the intrigues, jealousies, and strifes of the earlier years of Louis XIV's minority. The Queen mother, Anne of Austria, was at first hostile to him, but although she was declared sole Regent and guardian of the young King, Mazarin kept his place as Minister, and soon made himself indispensable to her by his wonderful business qualities, while the exquisite charm of his manner eventually gained her heart. It is said, in fact, that a secret marriage took place between the Queen Regent and her Prime Minister, but this has never been absolutely proved. The result of the close alliance between the Queen and himself was that Mazarin ruled with almost as unlimited sway as Richelieu had done. The Parlement of Paris, thinking to conquer political power, resisted the registration of edicts of taxation; but Mazarin caused the leaders of the opposition to be arrested; whereupon began the disturbances of the Fronde (q.v.). Twice compelled to retire from court, he made a triumphant entry into the capital in 1653 and in a short time had regained his former power.

In the internal government of the country those principles of despotism were established on which Louis XIV afterward acted. Mazarin continued Richelieu's foreign policy, waging war vigorously against the Hapsburg power in Austria and Spain; his most important diplomatic acts were in connection with the Peace of Westphalia in 1648 and that of the Pyrenees in 1659. The administration of justice in France under Mazarin became very corrupt, and the commerce and finances of the country underwent a great depression. As a financier, Mazarin was far inferior to Richelieu. He was avaricious and enriched himself at the expense of the country. He died at Vincennes, March 9, 1661. His magnificent library he bequeathed to the Collège Mazarin at Paris.

Bibliography. The best idea of Mazarin is obtained from his correspondence, published by Chéruel, "Lettres du cardinal Mazarin pendant son ministère," in the *Collection de documents inédits sur l'histoire de France*, first series (Paris, 1872–94). Consult also: C. Moreau, *Bibliographie des Mazarinades* (ib., 1850); Cousin, *Jeunesse de Mazarin* (Paris); Chéruel, *Histoire de France sous le ministère de Mazarin, 1651–1661* (ib., 1882); Arthur Hassall, *Mazarin* (ib., 1903); J. B. Perkins, *France under Mazarin* (2 vols., New York, 1915).

MAZAR-I-SHERIF, mȧ-zär'-ē-she-rēf'. The capital, a fortified town of Afghan Turkestan, situated about 9 miles east of Balkh (Map: Afghanistan, M 4). Its mosque (1420) is said to be the tomb of Ali, the son-in-law of Mahomet. It manufactures swords and other weapons. In the vicinity are mineral springs. Pop. (est.), 25,000.

MAZARRÓN, mȧ'thär-rōn'. A town of southeast Spain, in the Province of Murcia, situated 2½ miles from the Mediterranean coast, 16 miles west of Cartagena (Map: Spain, E 4). In the neighboring mountains are mines of iron and argentiferous lead, which date from the times of the Phœnicians and Romans; and the town contains several metallurgical establishments, besides soap factories and flour mills. A railroad 5 miles long connects it with its port in the small Bay of Mazarrón, where there is a good roadstead and a lighthouse. At this port is located one of the largest and best lead-smelting establishments of Spain, capable of producing 125 tons of lead daily. There is also considerable trade in lead and ores, machinery, coal, and timber. Pop., 1900, 23,362; 1910, 22,660.

MAZAS, mȧ'zȧ', PRISON OF. A prison in Paris in which the first trial of solitary confinement was made in France. It was built between 1845 and 1850 to replace the prison of La Force on the Boulevard Mazas (now the Boulevard Diderot), and was officially known as *Maison d'arrêt cellulaire.* The building was demolished in 1900.

MAZATEC, mä'zȧ-tĕk'. A tribe occupying the districts of Teotitlan and Tuxtepec in Oaxaca, Mexico. They are agricultural and are noted silk raisers, weaving gorgeous fabrics of that material, and having many curious beliefs and taboos in connection with the tending of the silkworms. In language the Mazatec are connected with the adjoining Chocho, Popoloco, Trique, and Ixcatec and the five together form the Mazatecan stock. This was formerly believed to be connected with Mixtec, but is probably distinct.

MAZATLAN, mä'sȧ-tlän'. A seaport in the State of Sinaloa, Mexico, situated at the entrance of the Gulf of California (Map: Mexico, F 6).

It is a well-built and picturesque town and has a handsome city hall, a nautical school, and two hospitals. A street railroad runs through the town, which is lighted by gas. The harbor is an open roadstead, but is regularly visited by several lines of steamers. It is on the main line of the Southern Pacific Railroad of Mexico and is an important distributing centre for the trade of the interior. The chief exports are silver, pearls, copper, lead, dyewoods, and skins. Pop., 1900, 17,852; 1910, 21,219. The bubonic plague appeared here in 1903 and caused many deaths. The city suffered a long siege and was captured by the Constitutionalists during the revolution in 1914. In 1912 its exports amounted to $4,263,480 and imports $2,531,800. It is the seat of a United States consul.

MAZDAK, mäz'dăk (470–?). A Persian reformer, who founded a religious and social sect that existed for a time and were known as Mazdakites, after his name. He was born at Persepolis and belonged originally to the Magian faith, being a priest at Nishapur. He became imbued with communistic and reformatory views and preached the doctrine not alone of the equality of mankind but of the community of property, including women, and the consequent abolition of marriage laws. Simplicity in manner of life and dress, and abstinence from animal food, except milk and eggs, were enjoined. He succeeded in converting to his faith King Kavadh, or Kobad (488–531 A.D.); but a revolution of the nobles, urged on doubtless also by the jealous Magian clergy, resulted in dethroning the King and placing Jamasp, his brother, on the throne (497 A.D.). Three years later Kobad was restored to power, and for political purposes he outwardly recanted his Mazdakite views. Towards the end of his reign, suspecting state intrigues by the Mazdakites, he allowed Mazdak and thousands of his followers to be put to death (528–29 A.D.). Traces of the sect lingered on in the neighborhood of Hamadan as late as the Seljukid era. Consult E. G. Browne, *Literary History of Persia* (London, 1909).

MAZE. See LABYRINTH.

MAZE, måz, HIPPOLYTE (1839–91). A French historian and politician, born at Arras. He entered the Ecole Normale Supérieure in 1859, became a fellow in history in 1863, and taught at the lycées of Cahors, Saint-Quentin, Angers, and Versailles. He was appointed a prefect of Landes in 1870. The next year, however, he returned to teaching and became first professor of history at the Lycée Fontanes in Paris. He was elected to the Chamber of Deputies in 1879 as a Republican and reëlected in 1881. From 1886 until his death he was Senator from Seine-et-Oise. A monument to him was erected in Viroflay in 1894. Among his publications are: *La république des Etats-Unis d'Amérique: sa fondation* (1869); *La fin de la révolution par la république* (1872); *Hoche en Vendée* (1882); *La lutte contre la misère* (1883); *Général Marceau* (1889).

MAZELLE, mä-zĕl', EDUARD (1862–). An Austrian meteorologist. He was educated at Graz and in 1883 became an assistant and in 1903 director of the Maritime Observatory at Trieste. He made important researches on atmospheric electricity and demonstrated that evaporation of sea water is slower than that of fresh water. He published a textbook of meteorology and oceanography for use in nautical schools.

MAZEP'PA, IVAN STEFANOVITCH (c.1640–1709). A leader of the Cossacks, born in the Russian Province of Kiev, of a noble family. After receiving a good education, he became a page in the service of John Casimir, King of Poland. There is a good tradition that a Polish nobleman who had surprised him in an intrigue with his wife, bound him naked on his own horse and lashed the animal out into the steppes. The horse carried him to his own distant residence—not to the Ukraine, as has been often said; but Mazeppa, out of shame, fled to the Ukraine, joined the Cossacks, rose to high distinction among them, overthrew their hetman, Samilovitch, and in 1687 was elected in his place. He won the confidence of Peter the Great, who used him in the Volhyna campaign of 1705–06 and loaded him with honors never before bestowed on any Cossack hetman, finally making him Prince of the Ukraine. But on the curtailment of the freedom of the Cossacks by Russia, Mazeppa, who never really liked the Czar's new ways as well as his own, hoping to achieve complete independence, entered into negotiations with Charles XII of Sweden, joined him with a considerable band (some 80,000 Cossacks), and took part in the battle of Poltava in 1709. When Mazeppa's treachery and insubordination were discovered his stronghold in the Ukraine was razed by Peter's orders. His sudden discomfiture cost him nearly all his power and prestige with his former following among the Cossacks. Moreover, he was excommunicated by the Metropolitan of Kiev. Mazeppa, with what few followers he could still muster, followed King Charles to Turkey. Despite Peter's offer of 300,000 ducats to the Sultan to have Mazeppa extradited, the latter was not turned over to Russia. He died in Bender in 1709. His story has been widely treated in painting, poetry, the novel, the drama (notably by Byron in his poem *Mazeppa*), and in music (notably by Liszt in a symphonic poem by that name).

MAZOIS, mä'zwä', FRANÇOIS (1783–1826). A French architect, born at Lorient. A pupil of the Ecole Polytechnique and of Percier (q.v.), he was employed (about 1808) by King Murat of Naples on his Portici palace, and later was pensioned and commissioned by Queen Caroline to study and report upon the ruins of Pompeii. The resulting work in four folio volumes, *Les ruines de Pompéii*, an epoch-making publication (1812), was followed by *Le palais de Scaurus, ou description d'une maison romaine* (1822) and other works. In 1820 he was appointed inspecteur général du conseil des bâtiments civils in Paris.

MAŽURANIĆ, mä'zhōō-rä'nĕch, IVAN (1814–90). A Croatian poet and statesman, born in Novi Sad (Neusatz). He studied at Fiume and Agram and practiced law for several years. He took an active part in promoting the national spirit of the Croats and wrote the influential manifesto *Hrvati Magjarom* (The Croats to the Magyars) (1848). He was made procurator general of Croatia and Slavonia in 1850. Afterward he became first chancellor of Croatia and Slavonia (1861) and from 1873 to 1880 was Ban, or governor, of Croatia. Mažuranić is one of the most representative as well as the greatest of Croatian poets. His poems first appeared in the *Danica Ilirska* (Star of Illyria) in 1835. His masterpiece is the epic poem on the death of the oppressive Ismail Čengić Aga, *Smrt Ismail Age Čengića* (1846). This fine poem has been

translated into French by Courrière (in the *Revue Britannique*, 1878) and into German by Kienberger (1874). Mažuranić also wrote (1844) two cantos in the manner of Gundulić (q.v.) to supply those missing in that poet's *Osman*.—His brother, ANTON MAŽURANIĆ (1850–88) was a distinguished philologist.

MAZURKA, mȧ-zōōr′kȧ (Pol., Mazur dance, so named from the Mazurs, a branch of the Polish nation inhabiting Masovia in Russian Poland and a district in East Prussia). A national Polish dance in triple time and moderate tempo. Its principal rhythm is ♩ ♩ ♩♪. Frequently the musical phrase ends with the second beat, so that the third becomes an up beat to the next bar. The history of the mazurka goes back to the sixteenth century, when it was a song accompanied by a dance. Augustus III (1733–63) introduced it into Germany, and from that country it spread to France and, about 1845, to England. The Russian mazurka differs from its original prototype in that it may be danced by any number of people, while the Polish mazurka is generally performed by either four or eight couples. The steps and even the figures are frequently varied. Chopin revolutionized the mazurka. He extended its form and introduced characteristic Polish melodies, leaving practically only the national character.

MAZZARA DEL VALLO, mȧt-sä′rȧ dĕl väl′lō. An episcopal city in the Province of Trapani, Sicily, 32 miles south of Trapani, where the Mazzara flows into the Mediterranean (Map: Italy, D 6). A massive wall 36 feet high encircles the city, which has many interesting ruins. Its cathedral and castle, dating from the eleventh century, and the archiepiscopal palace are the most attractive buildings. The inhabitants of the neighboring region are engaged in agriculture, and an important trade is carried on in barley, corn, olive oil, fruit, cotton, and wine. There are quarries near by. Mazzara del Vallo, the ancient Mazara, was settled by colonists from Selinus, and figured prominently in the early history of the island. Pop. (commune), 1901, 20,130; 1911, 24,865.

MAZZARINO, mȧt′sȧ-rē′nō. A town in the Province of Caltanissetta, Sicily, 35 miles east of Girgenti (Map: Italy, E 6). It has an old castle and sulphur springs in the vicinity. Its products consist of fruit, vegetables, and wine. Pop. (commune), 1901, 16,355; 1911, 15,920.

MAZZEI, mȧt-sä′ē, PHILIP (1730–1816). An Italian physician, author, and traveler, a native of Tuscany. After having studied medicine he practiced for several years in Smyrna and was engaged in business in London for more than 15 years. In December, 1773, he went to Virginia for the purpose of introducing grape and olive culture in that colony. There he became acquainted with Thomas Jefferson, and later, after his return to Italy, corresponded with him. From 1779 to 1783 he was the official agent of Virginia in Italy for the purchase of arms, ammunition, and supplies, and in 1785 he revisited America. The correspondence between him and Jefferson was renewed after this second visit, and in April, 1796, Jefferson wrote to him the famous "Mazzei letter." In it he bitterly attacked the Federalist leaders (including, by implication, Washington) for their "monarchistic" tendencies, and declared that democracy was being betrayed by "men who were Samsons in the field and Solomons in the council, but who have had their heads shorn by this harlot, England." The letter was translated into Italian and published in an Italian paper, translated into French and published in the *Moniteur* at Paris, where it was seen by an American by whom it was translated into English, and sent to the United States, where it appeared in print in May, 1797, soon after Jefferson's inauguration as Vice President. Its publication raised a furor among the Federalists, who, in their feeling against Jefferson, even suggested his impeachment. Mazzei subsequently became a privy councilor to the King of Poland, and later in life was pensioned by the Czar of Russia. He wrote *Recherches historiques et politiques sur les Etats-Unis de l'Amérique septentrionale* (4 vols., 1788).

MAZZINI, mȧt-sē′nē, GIUSEPPE (1805–72). An Italian patriot prominently connected with the struggle for Italian unity and the republican movement throughout Europe. He was born in Genoa, June 22, 1805, studied at the University of Genoa, and practiced law in his native city. In 1827 his first essay in literature, "Dell' amor patrio di Dante," appeared in the Liberal journal *Il Subalpino*, and he subsequently contributed critical, literary, and political papers to the *Antologia* of Florence and other papers. Soon after his departure from the university Mazzini threw himself with fervor into the democratic movement and in 1828 founded the *Indicatore Genovese*, which was, however, soon suppressed. In its pages originally appeared the essay subsequently republished under the title of *Scritti d'un Italiano vivente*. In 1830 Mazzini joined the Carbonari (q.v.) and at once became an active and influential member. He was soon arrested, detained for six months in the fortress of Savona, and finally liberated on condition of his departure from Italy. After short residences in several places he made his home in Marseilles, and thence addressed to Charles Albert of Sardinia the famous letter which caused him to be condemned to perpetual banishment. Having become convinced that the Carbonari was not efficient for the work of Italian regeneration, Mazzini now undertook the organization of a new Liberal league, Young Italy (1831). This organization sought to secure the overthrow of all existing Italian governments and the union of the peninsula under a republican government. In addition to its paramount aim, the general principles of this association enforced the obligation to labor for a common moral regeneration and the establishment of political equality over the world. Liberty, equality, and humanity were the watchwords of the body; education and insurrection the great agencies of its operations; assassination was erased from its statutes, and the symbolic dagger of the Carbonari was replaced by the more humane emblems of a book and the cypress. The white, red, and green tricolor flag of the society became that of the new Italian nation. Mazzini was the animating spirit of this league, which was the parent of similar associations adapted to the individual requirement of the various European nationalities. In 1834 Mazzini planned an armed invasion of Savoy from Switzerland and on February 1 an attack was made on some customhouse officials at the frontier of Savoy, but the undertaking failed utterly. In 1837 Mazzini quitted Switzerland for England and took up his residence in London. There he maintained incessant activity

in literary propaganda and was in touch with political agitators of many countries. He wrote for various periodicals, on literary subjects, communism, education, music, etc. After the February revolution of 1848 Mazzini went to Milan, where he was a resolute opponent of the proposed annexation of the smaller Italian states to Sardinia. He retired to Switzerland on the capitulation of Milan to the Austrians, only to reappear in Florence on the rising in Tuscany. He became a member of the provisional government, and when, almost simultaneously, Rome was proclaimed a republic, he was sent there as a deputy, and was elected triumvir. On the taking of Rome by the French troops under Oudinot he went to Switzerland and thence returned to London. He bitterly attacked the course of France in public letters to De Tocqueville and others. At his instigation, as president of the Italian National Committee, risings in Milan (1853) and in Genoa (1857) were attempted. In 1859, while lending the whole weight of his influence to the revolutionary movements going on in Italy, he combated the threatened French intervention. He assisted in organizing Garibaldi's expeditions of 1860, 1862, and 1867. Though repeatedly elected by Messina to the Italian Parliament Mazzini refused to take his seat under a monarchical government. In 1866 the Italian government abrogated the sentence of death under which Mazzini had been living for many years, but he refused to accept a "pardon for having loved Italy beyond all earthly things." In 1868 he fell into a dangerous illness, from the effects of which his health never recovered, though his zeal remained as ardent as ever. After an ineffective scheme for a republican rising in Sicily in 1870 Mazzini ventured to enter Italy and was arrested at Gaeta, where he remained a prisoner till Rome was occupied by the Italian army. On his death, at Pisa, March 10, 1872, the Italian government accorded him a public funeral. Of the value of Mazzini's services to the cause of Italian independence there are widely differing opinions. Republicanism was a cardinal principle with him, to which he adhered with inflexible tenacity, never being willing to yield his personal conviction to the actual necessities of Italy as did Manin, Garibaldi, and Crispi. Hence he antagonized the Sardinian monarchy and obstructed the work of Cavour. His impassioned writings often led less noble spirits into deeds that he would not at all approve. Mazzini possessed in the highest degree that personal fascination by which friends are converted into ardent partisans. In his private life he was a model of purity and frugal simplicity, as in his public career he was conspicuous for disinterestedness and self-abnegation. In his political ideas he was of the type of the democratic visionaries of the eighteenth century with his almost metaphysical and religious ideas of social harmony and justice, but he was singularly lacking in an understanding of economic forces and their rôle in social evolution. He was associated for a while with Karl Marx in the first Socialist international organization, but his failure to appreciate the true nature of the modern workingman's movement made this association unprofitable and it was soon dissolved.

Bibliography. A comprehensive edition of Mazzini's works, in 18 volumes, *Scritti edite ed inedite*, appeared in Milan, 1861–91. Editions of his letters were published at Milan in 1875, at Rome in 1885, and at Turin in 1888, and an English edition in six volumes at London in 1890–91. Consult: Simoni, *Histoire des conspirations mazziniennes* (Paris, 1870); Pietrode Nardi, *Giuseppe Mazzini, la vita, gli scritti e le sue dottrine* (Milan, 1872); E. A. Venturi, *Memoir of Joseph Mazzini* (London, 1877); Bouiller, *Un roi et un conspirateur: Victor Emanuel et Mazzini* (Paris, 1885); Saffi, *Il pensiero politico e sociale de Giuseppe Mazzini* (Rome, 1887); A. F. Schack, *Mazzini und die italienische Einheit* (Stuttgart, 1891); J. W. Mario, *Mazzini nella sua vita e nel suo apostolato* (Milan, 1891); W. J. Linton, *Recollections of Mazzini and his Friends* (London, 1892); Peretti, *Gli scritti letterarii di Giuseppe Mazzini* (Turin, 1904); Dora Melegari, *La giovine Italia e Giuseppe Mazzini* (Milan, 1906); John Maccunn, *Six Radical Thinkers* (London, 1907); R. S. Holland, *Builders of United Italy* (New York, 1908); W. R. Thayer, "Mazzini's Centenary," in *Italica* (Boston, 1908); *Cambridge Modern History*, vol. xi (New York, 1909); Bolton King, *Life of Mazzini* (new ed., ib., 1912); H. E. B. H. King, *Letters and Recollections of Mazzini* (London, 1912). See CAVOUR; GARIBALDI; ITALY.

MAZZONI, mät-sō′nē, GUIDO (1450–1518). An Italian sculptor, born at Modena and called *Il Modanino*. About 1491 he was employed at Naples and in 1495 he accompanied Charles VIII to France. His principal remaining works are groups, in colored clay, of life-sized figures lamenting over the body of Christ. The best are those in the churches of San Giovanni Decollata at Modena, Santa Maria della Rosa at Ferrara, and Monte Oliveto at Naples. They show unusual technique and a simple realistic treatment not common in that age. Other works by him are a group of the "Adoration," in the Duomo at Modena, and a bronze bust of King Ferdinand, in the Naples Museum.

MAZZONI, GUIDO (1859–). An Italian poet and scholar, born at Florence. He studied at Pisa and Bologna, was made professor of Italian language and literature at the University of Padua in 1887, and occupied the same position at the Florence Institute from 1894. His principal work as a scholar is *L' ottocento* (Milan), a history of Italian literature of the nineteenth century. Six collections of his verse appeared between 1882 and 1893.

MAZZONI, JACOPO (or GIACOMO) (1548–98). An Italian philosopher, born at Cesena. He studied at Bologna and Padua, held a professorship in the University of Pisa, and was called to a chair in the University of Rome by Pope Gregory XIII. He was one of the founders of the Accademia della Crusca. It is asserted that he defeated "the Admirable Crichton" (see CRICHTON, JAMES) three times in debate. Most of his writings were lost. Those extant include those in defense of Dante, viz., *Discorso composto in difesa comedia di Dante* (1572) and *Della difesa della comedia di Dante* (1587), and his philosophical works, *De Triplici Hominum Vita* and *In Universam Platonis et Aristotelis Philosophiam Præcludia* (1597).

MAZZUCHELLI, mät′sōō-kĕl′lē, GIOVANNI MARIA, COUNT (1707–65). An Italian literary encyclopædist; born at Brescia. He wrote biographies of Scipio Capece and Giusto de' Conti and edited Villani's biographies of illustrious Florentines. His principal and still indispensable work is the *Scrittori d' Italia* (6 vols., Brescia, 1753–63), conceived on such vast lines

that it reached only the letter B; four additional volumes of his notes, collected by his secretary, G. B. Rodella, are still unedited (Vatican); Narducci published *Giunte* thereto (Rome, 1884).

MAZZUOLA, mât-swō'lâ, Francesco. See Parmigiano.

MEAD, mēd (AS. *mēdu*, OHG. *metu, mito*, Ger. *Meth;* connected with Ir. *meadh*, Welsh *medd*, mead, OChurch Slav. *medŭ*, Lith. *medus*, Lett. *maddus*, honey, Gk. *μέθυ*, *methy*, mead, Av. *madu*, wine, Skt. *madhu*, honey, sweet). A fermented liquor made from honey. The honey is mixed with water, malt and often spices added, and fermentation is induced and conducted in the usual manner. Mead has been in use from very ancient times and was known equally to the nations of southern Europe and the barbarous tribes of more northern regions. The name is also applied to a beverage flavored with sarsaparilla and often charged with carbonic-acid gas.

MEAD, Edwin Doak (1849–). An American author and editor, born in Chesterfield, N. H. In 1866 he entered the employ of Ticknor and Fields, the Boston publishers. From 1875 until 1879 he studied at Oxford, Cambridge, and Leipzig, and upon his return to America began to lecture on American literature and politics. In 1883 he became director in Boston of the Old South Historical Work, and in 1889 succeeded Edward Everett Hale as editor of the *New England Magazine*, a position which he retained until 1901. He afterward devoted himself mainly to executive and literary work connected with the cause of international peace. His publications include *The Philosophy of Carlyle* (1881), *Martin Luther: A Study of the Reformation* (1884), *The Influence of Emerson* (1903), and many pamphlets on peace and arbitration.

MEAD, or **MEDE,** Joseph (1586–1638). A Church of England theologian. He was born at Berden, Essex. While a boy at school at Wethersfield he bought a copy of Bellarmine's Hebrew grammar and soon acquired a good knowledge of the language. He graduated at Christ Church, Cambridge, in 1610. In 1613 he was made a fellow of his college and reader of the Greek lectures on Sir Walter Mildmay's foundation, which office he occupied till his death. He was learned in mathematics, medicine, and various branches of natural science, history, antiquities, and the literature and sciences of the East. His chief work was *Clavis Apocalyptica* (1627), translated into English in 1643, which has been called the first rational attempt to interpret the Apocalypse. His complete works were published at London, 1648–52; new edition, with life, 1672. Consult Neal, *History of the Puritans.*

MEAD, Larkin Goldsmith (1835–1910). An American sculptor. He was born at Chesterfield, N. H., and studied under Henry K. Brown, of Brooklyn, N. Y. His earliest work in marble was called "The Recording Angel." In 1857 he modeled the colossal statue "Vermont" for the dome of the State House at Montpelier. "Ethan Allen" adorns the same building. During the Civil War he was for six months an artist for *Harper's Weekly.* After 1862 he resided chiefly at Florence. There he executed a number of statuettes, such as "Echo," "La Contadinella," "Sappho," "Mountain Boy," and "The Returned Soldier" (1866). His other works include the Lincoln monument at Springfield, Ill.; the soldiers' monument at St. Johnsbury, Vt.; "Columbus' Last Appeal to Isabella," Sacramento, Cal.; the statue of Ethan Allen (1874) in the National Statuary Hall at Washington; and the group, "The Return of Proserpine from the Realms of Pluto," in the main entrance of the agricultural building at the Columbian Exposition at Chicago. He executed a group of the Stanford family for Stanford University, California. Among his other works of note were a colossal statue, "The Mississippi River," for the Minneapolis courthouse, and portraits in bronze of John Hay, W. D. Howells, and Henry James. His work is characterized by fine feeling for effect, by precise and conscientious though somewhat harsh modeling, and by an abundance of detail. He was a brother of William Rutherford Mead.

MEAD, Richard (1673–1754). An English physician. He was born at Stepney and at an early age entered the University of Utrecht. After three years' study he went to Leyden, where he entered upon the study of medicine under the noted Professors Pitcairne and Hermann. Having taken his degree of doctor of philosophy and physics, he returned to Stepney and began the practice of his profession in 1696. In 1703 Dr. Mead was made a member of the Royal Society and a lecturer at St. Thomas's Hospital. His reputation both as a practitioner and as a writer on medical subjects was very great, and he was in constant correspondence with the most eminent scientists of the day in his own and foreign countries. He received the appointment of physician in ordinary to George II, and in 1716 was elected a fellow of the College of Physicians. In addition to his acquirements as a physician Dr. Mead devoted much time to the study of natural history, antiquarianism, and numismatics. He was an intimate friend of Bentley, Pope, and Johnson. Some of his works were first published in Latin and subsequently translated into English, French, and Italian. They include *A Mechanical Account of Poisons* (1702); *A Short Discourse concerning Pestilential Contagion* (1720; 8th enlarged ed., 1722); and *Monita et Præcepta Medica* (1751).

MEAD, William Rutherford (1846–). An American architect, born in Brattleboro, Vt., a brother of Larkin G. Mead. He graduated from Amherst College in 1867 and studied architecture under the late Russell Sturgis (q.v.), after which he spent nearly two years in foreign travel and study. He began the independent practice of architecture in 1872 in partnership with Mr. Charles F. McKim (q.v. for some of the most notable works of the firm). Two years later Mr. W. B. Bigelow joined them, but severed this connection in 1878; and in 1879, on the addition of the late Stanford White (q.v.) to the firm, it assumed the name of McKim, Mead, and White, by which it is still known. The hand and influence of Mr. Mead are traceable in all the works of this distinguished firm, though he never assumed supreme control of any of them. He became fellow of the American Institute of Architects (1902), a member of the American Academy of Arts and Letters, and president of the American Academy in Rome. In 1902 he received the degree of LL.D. from Amherst College, was elected to the National Academy of Design in 1910, and received the Gold Medal of Honor of the National Institute of Arts and Letters.

MEADE, mēd, George Gordon (1815–72). An American soldier, born of American parentage at Cadiz, Spain, Dec. 31, 1815. He attended school in Philadelphia, Washington, and Baltimore; graduated at West Point in 1835, and served in the Seminole War. In October, 1836, he resigned from the army, adopted the profession of civil engineer, and between 1837 and 1842 was employed as an assistant engineer in the surveys made by the United States government of the delta of the Mississippi, the Texas boundary, and the northeastern boundary of the United States. In 1842 he was reappointed to the army as a second lieutenant in the corps of topographical engineers. On the breaking out of the war with Mexico, when General Taylor crossed the Rio Grande, he was ordered to the front and served with distinction throughout the war. Later he was employed in superintending river and harbor improvements and in the construction of lighthouses on Delaware Bay and off the coast of Florida. He was promoted to be first lieutenant in 1851 and captain in 1856 and had charge of the national survey of the northern lakes until 1861. At the outbreak of the Civil War he was ordered to Washington; was commissioned brigadier general of volunteers Aug. 31, 1861, and was placed in command of the second brigade of the Pennsylvania reserve corps. He was in the action at Dranesville, Va., December 20; was at Mechanicsville, June 26, 1862, and at the battle of Gaines's Mill on the following day; and served with his reserves throughout the Peninsular campaign, being severely wounded, June 30, at the battle of Frazier's Farm. On August 29–30, having recovered from his wound, he was engaged in the second battle of Bull Run, and in September took command of a division of the First Army Corps. At the battle of Antietam he was slightly wounded and had two horses shot under him. In recognition of his gallantry in this battle he received command of the Fifth Army Corps and on Nov. 29, 1862, was commissioned major general of volunteers. He was engaged in the battles of Fredericksburg and Chancellorsville, covering the retreat at Chancellorsville with his corps and guarding the crossings until the entire army was safely over the Rappahannock. On June 28, 1863, he was unexpectedly ordered to succeed General Hooker in the command of the Army of the Potomac. The main army of the Confederates, under General Lee, had invaded Pennsylvania, and it devolved upon Meade to arrest this movement and drive back the enemy. Portions of Lee's army had reached York, Carlisle, and the Susquehanna; but upon the advance of the Federal army these were called in. On July 1 the hostile armies met at Gettysburg and a three days' battle ensued, which resulted in the utter discomfiture of Lee, who, however, was not pursued with any vigor. (See Gettysburg, Battle of.) For this victory Meade was publicly thanked by a resolution of Congress passed Jan. 28, 1866. From May 4, 1864, to April 9, 1865, General Meade commanded the Army of the Potomac, under General Grant, through the bloody struggle in the Wilderness and until the surrender of Lee. On Aug. 18, 1864, he was commissioned a major general in the United States army. At the close of the war he was placed in command of the Military Division of the Atlantic, which command he retained from July 1, 1865, to Aug. 6, 1866. During the years 1866–67 he was in command of the Department of the East, and subsequently of the third military district of the South (under the reconstruction laws). From March, 1869, until his death he was again in command of the Military Division of the Atlantic. He died on Nov. 6, 1872. Citizens of Philadelphia presented him with a house, and after his death a fund of $100,000 was collected by subscription and presented to his family. Consult R. M. Bache, *Life of General G. G. Meade* (Philadelphia, 1897), and I. R. Pennypacker, *General Meade* (New York, 1901), in the "Great Commanders Series."

MEADE, Richard Worsam (1837–97). An American naval officer, born in New York City. He entered the navy as midshipman in 1850; became navigating officer of the *Cumberland* in 1856; coöperated with General Sherman as commander of a division of the squadron off Helena, Ark., in breaking up guerrilla warfare on the Mississippi River in 1862–63; commanded the marines in New York City during the draft riots there in July, 1863; and subsequently served with distinction in the South Atlantic and West Gulf blockading squadrons. After the close of the war until 1868 he acted as head of the department of seamanship and naval tactics at the United States Naval Academy. He then served for a time in Alaska, and from 1871 to 1873, in command of the *Narragansett*, cruised in the Pacific. After his return he acted as president of the board appointed to revise the ordnance instructions of the navy. He was promoted to be captain in March, 1880, and to be commodore in May, 1892. He was naval commissioner of the government to the World's Columbian Exposition at Chicago, and succeeded Admiral Stanton in command of the North Atlantic squadron in 1894. In the same year he was promoted to be rear admiral, but a disagreement between him and the Navy Department led to his retirement at his own request in May, 1895.

MEADE, William (1789–1862). A Protestant Episcopal bishop of Virginia. He was born near Millwood, Va., graduated at Princeton in 1808, studied theology, and was ordained priest in 1814. He was appointed assistant minister at Millwood, was afterward rector of Christ Church, Alexandria, Va., and in 1821 returned to Millwood as rector. In 1829 he was appointed Assistant Bishop and in 1841 Bishop of Virginia. He contributed liberally to the foundation of the Diocesan Theological Seminary at Alexandria. He was an active member of the American Colonization Society and was one of the founders of the Evangelical Knowledge Society (1847). In 1861 he labored to prevent the secession of Virginia, but acquiesced when that action was finally determined upon. Meade was strongly opposed to the Oxford Movement (q.v.) in the Church of England, and in his efforts to raise the Protestant Episcopal church in Virginia from a condition of spiritual apathy, which were successful, he was influenced by Evangelical or Low Church sympathies. (See Evangelical.) His principal literary productions are: *Family Prayers* (1834); *Letters on the Duty of Affording Religious Instruction to those in Bondage* (1834); *Companion to the Font and the Pulpit* (1846); *Lecture on the Pastoral Office* (1849); *Lectures to Students* (1849); *Reasons for Loving the Episcopal Church* (1857); *Old Churches, Ministers, and Families of Virginia* (1857); *The Bible and the Classics*

(1861). A memorial of Bishop Meade was published by the coadjutor bishop of his diocese, the Rev. Dr. John Johns (Baltimore, 1867).

MEADOW, mĕd'ō (AS. *mœd*, OFries. *mede*, meadow, OHG. *mata-screch*, grasshopper, Ger. *Matte*, meadow; probably connected with OHG. *mœn*, Ger. *mähen*, AS. *māwan*, Eng. *mow*, Lat. *metere*, Gk. *ἀμᾶν*, *aman*, to reap, OIr. *meithel*, party of reapers). A tract of low, level land, especially upon the margin of a stream, in which the dominant plant forms are grasses and sedges. Meadows are very characteristic of New England, northern Europe, and many mountainous regions. Some writers hold that meadows are the product of artificial conditions; others that they are natural formations. It seems scarcely to be doubted that alpine meadows are natural, either because trees fail to obtain a foothold on account of snowslides or because the snow remains long in such situations and grasses take possession during the short summer if there is sufficient soil moisture. Meadows may be due to continued grazing or mowing, because tree vegetation may be kept down by such agencies. On the other hand, they are extremely unfavorable for the development of trees, which might fail to develop even in a region specially favorable to tree growth, since seeds would germinate with difficulty. Hence a meadow may perpetuate itself naturally, even though originally artificial. Besides the grasses other plants are found in meadows, among which are species of vernal herbs, which mature before mowing time arrives. Some botanists, as Wettstein, believe that plants have acquired certain habits which adapt them to life in meadows that are annually mowed.

Since 1899 the term "meadow" has been used in the soil surveys of the United States government to designate various types of wet land, even some covered with trees.

From an agricultural standpoint a meadow is either a lowland or an upland field upon which hay or pasture grasses grow from self-sown or hand-sown seed. They are also permanent or temporary as well as natural and artificial. When the grasses are fed down by stock, meadows are called pastures. For artificial meadows the soil is plowed deep and brought to the very best condition before the seed is sown. A rich, clean soil of fine tilth adds greatly to the weight of the crop. Frequently grass seed is sown with small grain as a nurse crop, but the practice is not always successful, since the faster-growing cereal deprives the young grasses of light and they consequently fail. The best method is to sow the grass seed broadcast without a nurse crop. Timothy, redtop, fescue grass, orchard grass, oat grass, rye grass, blue grass, bent grass, and many other grasses are very commonly grown either as mixtures or alone. Timothy is often grown as a single crop. Clover is frequently added to a grass mixture. When a mixture is grown for hay, grasses which bloom about the same time are selected, but when used for pasture species that ripen at different times are preferred. Mowing machines and other implements have quite revolutionized the method of haymaking within the last 50 years and have enabled the farmer to make use of more extensive meadows than when all the work was done by hand. See also HAY; PASTURE. Consult Joseph E. Wing, *Meadows and Pastures* (Chicago, 1911).

MEADOW FESCUE. See FESCUE.

MEADOW FOXTAIL. A valuable fodder grass. See FOXTAIL GRASS.

MEADOW GRASS. A name applied to many of the numerous species of the genus *Poa*, which are chiefly natives of the temperate and colder parts of the world and form a very important part of the herbage of pastures and meadows. Most of the species are slender, nutritious, and rather abundant. The rough-stalked meadow grass (*Poa trivialis*) and the blue grass or smooth-stalked meadow grass (*Poa pratensis*) are among the most common and are esteemed among the most valuable for sowing in mixtures of grasses for pasture and for lawns. The Abyssinian meadow grass (*Poa abyssinica*), an annual species, yields immense returns of herbage in its native country. *Poa annua* is a common species, frequently found as a weed in cultivated grounds, but it is employed with advantage for sowing on lawns in towns and wherever from any cause perennial grasses are apt to be destroyed. It is often to be seen in flower, and is said to ripen its seeds in four or five weeks from the time of sowing. It is very abundant in most parts of Europe. Canada blue grass, *Poa compressa*, is a common species, the seed of which is often used as an adulterant of the true blue grass or smooth meadow grass. The name meadow grass is sometimes given to species of *Alopecurus*, which are more commonly known as foxtail grass (q.v.). See BLUE GRASS.

MEADOW LARK. A North American starling-like bird frequenting meadows and open places. Few American song birds are more general favorites. This is not a lark at all, but belongs to the family Icteridæ and is therefore a near relative of the bobolink, oriole, and blackbird. The genus (*Sturnella*) contains only two well-marked species, the common meadow lark (*Sturnella magna*) of the eastern United States and the Western meadow lark (*Sturnella neglecta*), but there are two subspecies of the Eastern bird which differ but slightly from the true *magna magna*. The common meadow lark ranges in summer from New Brunswick to the Gulf of Mexico, east of the Mississippi, and even in winter only retreats as far south as southern New England and Illinois. The Western meadow lark occupies the western half of the continent and extends southward into western Mexico, while other subspecies occur in Cuba and Mexico. Meadow larks are about 10¾ inches in length, with large feet and a long, straight, sharp bill. The feathers of the upper surface are prevailingly black, with rufous and buff borders and tips, so that the whole upper surface is variegated with those three colors. The throat, breast, and anterior half of the belly are bright yellow, with a prominent black crescent about the middle of the breast. The tail feathers are narrow and short, and when the bird takes to the wing the white outer ones become very conspicuous. The Western meadow lark has lighter upper parts, more perfect, less confluent bars on the tail feathers, and the sides, as well as the front, of the throat are yellow. The notes of the meadow lark are clear and strong—a sort of cheerful whistle—but Chapman says that they differ in different localities, so that the notes of the Florida birds are markedly different from those heard in the Northern States. The notes of the Western meadow lark are famous for their musical quality. The contrast between its brilliant song and that of the Eastern form, added to other peculiar traits, is convincing of the full

specific rank of the Western bird. Consult on this point Coues, *Birds of the Northwest* (Washington, 1874).

Meadow larks feed upon both seeds and insects, which they obtain upon the ground in the open meadows and fields. In summer they are not gregarious, though several pairs may be seen in neighboring fields; but in winter they are often found in swamps in some numbers. The nest is built upon the ground and is composed of grasses so arranged as to arch over at the top and make a more or less completely covered shelter. The eggs (see Colored Plate of EGGS OF SONG BIRDS) are four to six in number, large for the size of the bird, white, marked chiefly at the larger end with bright brown. Although not a game bird, meadow larks are frequently hunted both for sport and food, but they are not especially desirable for the table, and the shooting of them is nearly everywhere illegal. See Plate of LARKS AND STARLINGS.

MEADOW MOUSE. The American name for the short-tailed wild mice of the genus *Microtus* of the class called voles in Europe. The commonest species is the widespread *Microtus pennsylvanicus*, called in the older books *Arvicola riparia*. Many other species and subspecies are catalogued. See Plate of MICE AND JERBOAS in article MOUSE.

MEADOW MUSSEL, or HORSE MUSSEL. See MUSSEL.

MEADOW RUE. See Plate of MINT.

MEADOW SAFFRON. A European plant. See COLCHICUM.

MEADOW SNIPE. A gunner's name for snipe frequenting grassy places, especially Wilson's and the jacksnipe. (See SNIPE.) The marsh hens and corn crake are often called meadow crake or drake, meadow clapper, etc., by sportsmen. See PECTORAL SANDPIPER.

MEADOW SWEET. A plant. See SPIRÆA.

MEADOW VETCHLING. See LATHYRUS.

MEAD'VILLE. A city and the county seat of Crawford Co., Pa., 122 miles by rail north of Pittsburgh, on French Creek and on the Erie, the Northwestern Pennsylvania, and the Bessemer and Lake Erie railroads (Map: Pennsylvania, A 2). It is the seat of Allegheny College (Methodist Episcopal), established in 1815, and of the Meadville Theological School (Unitarian), opened in 1844; and has four schools of music, two city hospitals, a fine courthouse, and a public library. Other noteworthy features are Huidekoper, Diamond, and Oakwood parks, and three iron bridges. Meadville is in a fertile agricultural valley, and its industries are represented by railroad shops of the Erie, iron works, malleable-iron works, vise works, planing and flour mills, breweries, a distillery, and manufactories of automatic tanks and cans, tools, brass and iron castings, chemicals, lumber, mantels, corsets, vaults, etc. The city is also an important market and a shipping point for the oil regions. The commission form of government, providing for a mayor and four councilmen, was adopted in 1913. Settled in 1788, Meadville became a borough in 1823 and was chartered as a city in 1866. The municipality owns the water works and electric-light plant. Pop., 1900, 10,291; 1910, 12,780; 1920, 14,568.

MEAFORD, mē'fērd. A lake-port town of Grey Co., Ontario, Canada, on Nottawasaga Bay, an inlet of Georgian Bay, Lake Huron, 20 miles west-northwest of Collingwood, on the Grand Trunk Railway (Map: Ontario, D 4). It has a fine harbor, with a depth of 20 feet of water. There is an armory. The industrial establishments include brickyards, fruit evaporators, grain elevator, flour mills, tannery, canning factory, and manufactories of builders' materials, furniture, blankets and yarns, flooring, boxes, foundry and machine-shop products. There is excellent steamboat communication with western ports. Electric power is available for manufacturing. The town is situated in an apple-growing district. Pop., 1901, 1916; 1911, 2811; 1915 (local est.), 3200.

MEAGHER, mā'hēr, THOMAS FRANCIS (1823–67). An Irish-American soldier. He was born at Waterford, Ireland, Aug. 3, 1823, and was educated at the Jesuit College of Clongowes Wood, County Kildare, and at Stonyhurst College, Lancashire, England. On the outbreak of the French revolution of 1848 he was sent to Paris by the Irish Confederation to congratulate the republican leaders. On his return he was arrested on a charge of sedition and was later tried for high treason, found guilty, and sentenced to death, but subsequently the sentence was changed to banishment for life to Tasmania. Transported thither, he escaped in 1852 and succeeded in reaching New York. Subsequent to 1855 he practiced law in New York, and in 1856 became editor of the *Irish News*. At the beginning of the Civil War in 1861 he organized a company of zouaves, joined the Sixty-ninth New York Volunteers, was acting major at the first battle of Bull Run, and after serving the three months of the first call, returned to New York and organized the Irish brigade, being commissioned brigadier general on Feb. 3, 1862. He served in the latter part of the Peninsular campaign and participated in the second battle of Bull Run and in the battles of Antietam and Fredericksburg, in the last of which he was seriously wounded while leading a charge on Marye's Heights. After Chancellorsville he resigned because little was left of his brigade, but he was recommissioned in 1864 and for some time was in command of the District of Etowah. He was appointed secretary of Montana Territory in 1865, and in 1866 served as Governor pro tempore. On July 1, 1867, he fell from the deck of a steamer, at Fort Benton, on the upper Missouri, and was drowned. He published *Speeches on the Legislative Independence of Ireland* (1852) and *Last Days of the Sixty-Ninth in Virginia* (1861). Consult M. Cavanagh, *Memoirs of General Thomas Francis Meagher, with Selections from his Speeches, Lectures, etc.* (Worcester, Mass., 1892).

MEAGRE, mē'g'r, or **MAIGRE,** mā'g'r (OF., Fr. *maigre*, lean, from Lat. *macer*, lean; connected with Gk. *μακρός*, *makros*, long). Any of several European drumfish of the world-wide genus *Sciæna*. The typical meagre is *Sciæna aquila*, which ranges from Great Britain to the coasts of the Indian Ocean, but is best known about the Mediterranean Sea, where it has been very highly esteemed since the days of antiquity. It reaches a length of 6 feet, but ordinary specimens are about half that. The color is brownish gray on the back, with silvery gray sides and a white abdomen. It has always been highly valued, especially by the Italians, but to English palates the flesh seems rather dry and tasteless. A closely related species is the umbrine (*Sciæna umbrina*), also one of the favorite food fishes of the Mediterranean, and occasionally taken near Great Britain and elsewhere.

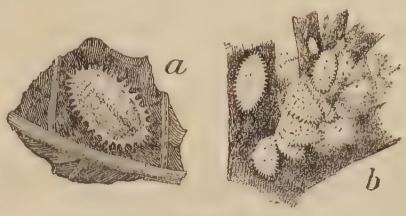
MEAL. Sometimes used to mean ground wheat (flour), but more often to mean some other ground cereal, as oat meal or corn meal, or similar product, as cassava meal or banana meal. See BREAD; FLOUR; MAIZE, *Feeding Value.*

MEAL, COTTONSEED. See COTTONSEED AND ITS PRODUCTS.

MEAL MOTH. A pyralid moth (*Pyralis farinalis*), cosmopolitan in distribution, which infests milling establishments and storerooms and which in the larval stage feeds upon stored grain, bran, and even straw, and occasionally upon dried plants in herbaria. A closely allied species (*Pyralis costalis*) is known as the clover-hay worm. There are probably four generations annually. The eggs are laid in small clusters and the larvæ live in long tubes constructed of silk and particles of meal and other material, and while thus incased in the obscure corners in which they habitually live they are completely concealed from observation. Another species, commonly called the Indian-meal moth (*Plodia interpunctella*), in the larval stages feeds not only upon Indian meal, but upon all sorts of dried vegetable products, such as peas, beans, nuts, acorns, and dried fruit, and upon root and bark preserved in drug stores.

MEAL WORM. The larva of either one of two or more beetles of the family Tenebrionidæ, which, originally of Asiatic or European origin, have become cosmopolitan enemies of meal, flour, bran, and other mill products. They develop in refuse grain dust accumulated in dark corners and out-of-the-way places in flour mills, bakeries, stores, and stables. They are also of importance as enemies to ship biscuits and other kinds of crackers. These meal worms are easily bred in confinement, have a commercial value to the bird dealer, and are kept on sale in bird stores as food for soft-billed cage birds. The yellow meal worm (*Tenebrio molitor*) is the commonest of these insects. The beetle is over half an inch in length, somewhat flattened, shining, and nearly black; and the larva is cylindrical, slender, over an inch long, and has a waxy appearance and a yellowish color. The eggs are white, bean-shaped, about one-twentieth of an inch long, and are deposited in the meal or other food substance. The dark meal worm (*Tenebrio obscurus*) is very similar to the yellow meal worm, but dull black in color; it has been found in black pepper, phosphate fertilizers, cottonseed and cotton meals, and in commercial soda ash. Perfect cleanliness about storerooms and milling establishments is the best preventive of the attacks of these insects, and rooms or buildings once infested may be freed by the use of disulphide of carbon or hydrocyanic acid gas. Consult F. H. Chittenden, in *United States Department of Agriculture, Division of Entomology, Bulletin No. 4,* N. S. (Washington, 1896).

MEALY BUG. A naked scale insect of the genus *Dactylopius,* so called because of the white, meal-like powder which covers it. Like other members of the subfamily Coccinæ, the body is not covered by a scale, and the females keep the form of the body with the segments distinct until the end, and also retain the power of motion. The antennæ of the female are six-jointed in the larva and eight-jointed in the adult; the male larva has seven-jointed antennæ. The tarsi are furnished with four digitules, and the anal ring with four hairs. Most of the mealy bugs are tropical or subtropical, but several species breed abundantly out of doors in the southern United States, e.g., *Dactylopius citri,* a well-known enemy of orange groves in Florida. It is, however, as greenhouse pests in temperate



THE MEALY BUG.

a, female (enlarged); *b,* group of mealy bugs on a tree.

regions that the mealy bugs are best known. They secrete a certain amount of honeydew, and are frequently attended by ants, which are responsible for much of the spread of mealy bugs in greenhouses, since they attend the young bugs and carry them to appropriate feeding grounds. The mealy secretion which covers these bugs renders it difficult to destroy them with some of the insecticide mixtures, but a dilute kerosene-soap emulsion is efficacious. Consult J. H. Comstock, *Report of the United States Department of Agriculture* (Washington, 1880), and J. H. and A. B. Comstock, *Manual for the Study of Insects* (8th ed., Ithaca, N. Y., 1909). See COCCIDÆ.

MEALYWING. A bug of the family Aleyrodidæ, so called from the white, meal-like excretion on the wings of the adult insect. The mealywings are allied to the aphids and scale insects. They are very small, frequently minute, and infest the leaves of plants, both of herbs and of trees, usually on the lower side. In their early stages they are scalelike and much resemble some of the Coccidæ. Unlike the Coccidæ, the two sexes develop in a similar manner, and both males and females are active and have two pairs of wings. In the early stages the body may be more or less covered with wax. The antennæ of the adults are seven-jointed, and the eyes are usually constricted near the middle, being sometimes entirely divided. The wings are broad and well rounded, and may be clear or spotted and banded in different ways. About 150 species are known, of which more than 50 occur in the United States. The most destructive species is *Aleyrodes citri,* which attacks the orange and lemon in Florida and Louisiana and causes the leaves to turn yellow and die. They secrete a considerable amount of honeydew, which attracts the spores of smut fungi, resulting ultimately in the blackening of the foliage of the orange trees.

MEAN (OF. *meien, moien,* Fr. *moyen,* from Lat. *medianus,* middle, from *medius,* middle). In mathematics, a term interpolated between two other terms of a series. The *arithmetic* mean of two quantities a, b, is $\frac{a+b}{2}$, their *geometric* mean is $\sqrt{ab}$, and their *harmonic* mean is $\frac{2ab}{a+b}$. The arithmetic mean is greater than the geometric mean, and the latter is greater than the harmonic mean. In averaging observed results of physical experiments the mean result may be found by dividing the sum of the observed results by the number of observations. But in case the observed results are not regarded as equally accurate, certain numbers may be as-

signed to these results representing their relative accuracy; e.g., four men, A, B, C, D, have determined the area of a triangle and found it to be 19.50, 19.75, 20, and 20.25 square meters, respectively. If the relative accuracy of their work may be represented by the numbers 3, 2, 2, 4 respectively, the area of the triangle will be taken as

$$\frac{3 \cdot 19.50 + 2 \cdot 19.75 + 2 \cdot 20 + 4 \cdot 20.25}{3 + 2 + 2 + 4} = 19.91.$$

For further practical methods of averages, see LEAST SQUARES, METHOD OF; GEOMETRIC MEAN.

MEAN CENTRE OF POINTS, or MEAN POSITION, CENTRE OF. See CENTRE.

MEAN'DER. A river of Asia Minor. See MÆANDER.

MEANDER, or MÆANDER. A classic form of running ornament, substantially the same as the Greek fret (q.v.), composed of elements successively turning sharp angles (usually right angles) so as to wind in and out while progressing as a whole in one direction. The name is derived from the river Mæander (q.v.), which was famed for its devious windings. The Greek wave, or Vitruvian scroll, is its curvilinear analogue.

MEAN DURATION OF LIFE. See LIFE, MEAN DURATION OF.

MEAN'ING (from *mean*, AS. *mœnan*, OHG. *meinan*, Ger. *meinen*, to think; connected with OChurch Slav. *mĕniti*, Skt. *man*, to think). The mental processes that constitute the unanalyzed consciousness of ordinary, everyday experience are always surcharged with meaning or significance. Mind, as it is given, is mind in function, mental stuff that stands for, represents, symbolizes, refers to objects and events in the outside world. The value and validity of such objective reference form a question for epistemology. (See KNOWLEDGE, THEORY OF.) The psychological problem, on the other hand, is to determine, first, whether meaning is intrinsic to mental process, and, secondly, how meaning is represented in consciousness.

The first of these questions must, apparently, be answered in the negative; there are many facts which lead us to the view that meaning is extrinsic and not intrinsic to mental process. 1. A meaning may be added to a given experience. A diagram in a scientific book lacks a meaning until we read the legend beneath it; a particular tonal experience may mean "sound," "whistle," "fire," or "fair weather," and we may add as many other meanings as we like. 2. A meaning may be observed to "grow" or to develop; as one follows the progress of a sketch beneath the artist's hand, or reads and rereads a complex argument, the meaning of lines and colors, or of successive sentences, slowly "dawns" upon one. 3. It is possible to strip the meaning from an item of experience; if a word is repeated aloud many times over, or if a printed word is stared at for some time, the sound or sight presently becomes strange and the familiar meaning drops away. (For like phenomena in the sphere of pathology, see APHASIA.) 4. Occasionally mental process and meaning are disjoined in time; we often ask to have a statement repeated, but before it is repeated the meaning has come. It seems clear, therefore, that meaning and mental process are separable; and the further treatment of meaning, in its own right, may therefore be left to logic.

There remains, however, the second psychological problem: to discover how meaning is represented in consciousness. It follows from the previous discussion that no single element of mind, no isolated sensation, can mean; meaning will appear only when some other mental process is added or accrues to it. The accruing process, as context or setting, may then "give" a meaning to the first. Analysis shows, in fact, that when meaning is consciously present the experience divides into "core" and "fringe," into presentation proper and vehicle of meaning. Let us suppose, for the sake of illustration, that two persons, A and B, are walking along a lonely road at night; that A is unfamiliar with the region and is therefore apprehensive lest wild animals may be in the neighborhood, but that B knows the country thoroughly and has no such fear. Both hear a sound in the bushes, and the two auditory experiences are to all intents and purposes identical, yet A takes the sound to mean "bear," while B interprets it, perhaps, as "dog." The associative supplementing or imaginal fringe of the presented sound differs, and this difference places a different meaning on the core of the experience. The processes of the "fringe," whatever they may turn out to be on further psychological analysis, are the context or setting of the presentation and the vehicle of its meaning.

If we now proceed to ask how this functional differentiation of core and fringe has come about we must go for an answer to biology. The organism is placed within an environment, which affects it primarily by way of the organs of sense, and to which it responds primarily by way of movement. We may assume, then, that meaning is at first carried by kinæsthesis: some environmental stimulus sets up a sensory process, the organism meets the physical situation by instinctive movement, and the "feel" of the movement is the context of the presentation. Children, we may note, begin to define objects in terms of motor response: a knife is what you cut with, a bag is what you put things into. But as evolution proceeds situations become more complicated, and may be internal as well as external, mental as well as physical. Kinæsthesis, while it remains important, ceases to be the sole carrier of meaning; all sorts of processes are pressed into that service; so that, in the instance taken, the meaning "bear" may have been carried by a verbal image and an organic shudder, the meaning "dog" by a fleeting visual image of some familiar animal.

We have not yet, however, exhausted our illustration. A and B, it is plain, are subject to different determining tendencies; the one is apprehensive of danger, the other feels himself secure. These tendencies determine the nature of the associative supplementing, and are thus responsible for the difference of meaning which comes to consciousness as "bear" and "dog." It must not be supposed, however, that meaning is always of this conscious sort. The habitual situations of everyday life are very often taken meaningfully, although their meaning has no discernible representation in consciousness: we avoid a puddle in the path, we open a book and read, we feel a draft and put down the window, without any supplementary processes that mean wet feet, or the getting of information, or an impending cold. When the situation is new every presentation has its conscious context; but as time goes on, and the same situation is

repeated again and again, this context gradually fades out, until ultimately nothing remains but a nervous predisposition, and meaning is carried in purely physiological terms.

Consult: William James, *Principles of Psychology* (2 vols., New York, 1899); E. B. Titchener, *Experimental Psychology of the Thought Processes* (ib., 1909); id., *Textbook of Psychology* (ib., 1910); W. B. Pillsbury, *Essentials of Psychology* (ib., 1911); G. F. Stout, *Manual of Psychology* (London, 1913).

MEANS SMOKE TELEGRAPH. See MILITARY AËRONAUTICS.

MEARES, mērz, JOHN (c.1756–1809). An English navigator. He entered the navy in 1771, served against the French in the West India Islands, and at the conclusion of peace in 1783 became captain in the merchant service. He went to India and formed at Calcutta what was called the Northwest America Company for opening trade with Russian America. In 1786 he explored a part of the coast of Alaska. He went to China by way of the Hawaiian Islands and entered Nootka Sound (1788). The next year he sent to Nootka Sound three ships which were seized by the Spaniards on the ground that Englishmen had no right to trade in those waters. The act caused great excitement in England and a large fleet known as the Spanish Armament of 1790 was collected to punish the Spaniards, who saved themselves only by making ample reparation. Meares published *Voyages Made in the Years 1788 and 1789 from China to the Northwest Coast of America* (1790).

MEARIM, mā'ā-rēn'. A river in the State of Maranhão, Brazil, rising in the Serra do Negro and flowing north into the Bay of São Marcos near the city of Maranhão (Map: Brazil, J 4). It is about 680 miles long and is navigable to small vessels as far as Barra do Corda.

MEARNS, mērnz. A county of Scotland. See KINCARDINESHIRE.

MEARS, mērz, HELEN FARNSWORTH (1878–1916). An American sculptor. She was born at Oshkosh, Wis., and studied at the State Normal School in Oshkosh and art in New York and Paris. Her most important works include a marble statue of Frances E. Willard (1905, Capitol, Washington); portrait reliefs of Edward MacDowell (Metropolitan Museum, New York) and Augustus Saint-Gaudens; portrait busts of George Rogers Clark and William L. G. Morton, M.D. (Smithsonian Institution, Washington). In 1904 her "Fountain of Life" (St. Louis Exposition) won a bronze medal. She made New York her residence and exhibited there and in Chicago.

MEARS, JAMES EWING (1838–). An American surgeon. Born at Indianapolis, he received his education at Trinity College, Conn. (A.M., 1861; LL.D., 1908), and Jefferson Medical College, Philadelphia (M.D., 1865). During the Civil War he served as captain and as medical cadet and practiced in Philadelphia after 1865. From 1870 to 1898 he was professor of anatomy and surgery at the Pennsylvania College of Dental Surgery and held the office of surgeon in chief of the Pennsylvania National Guard. He contributed largely to the surgical journals and is author of *Practical Surgery* (1878; 2d ed., 1885).

MEASLES, mē'z'lz (from MDutch *maselen, masselen,* spots; connected with OHG. *masala, masara,* Ger. *Maser,* dim. of OHG. *māsa,* Ger. *Mase,* spot, mark of a wound), known also as RUBEOLA and MORBILLI. One of the group of diseases termed *exanthemata.* (See EXANTHEMA.) It is communicable from person to person and seldom occurs more than once in the same individual. After a period of incubation of about a fortnight, appear headache, slight disturbance of the stomach, rise of temperature towards evening, lassitude, slight injection of the eyes, with trifling coryza. After 48 to 72 hours coryza is marked. In the mouth are seen the signs of the disease, the exanthema, "Koplik's spots." These are isolated rose-red spots, with a minute bluish-white centre on normally colored mucous membrane.

The characteristic eruption usually appears upon the fourth day from the commencement of the febrile symptoms and the catarrh, seldom earlier, but not infrequently some days later. It is a rash, consisting at first of minute red papulæ, which, as they multiply, coalesce into crescentic or irregular patches. It is two or three days in coming out, beginning on the face and neck, and gradually traveling downward. The rash fades in the same order as it occurs, and, as it begins to decline three days after its appearance, its whole duration is about a week. The red color gives way to a somewhat yellowish tint, and the cuticle crumbles away in a fine branlike powder, the process being often attended with considerable itching.

There are two important points in which it differs from smallpox (q.v.), with which in its early stage it may be confounded; they are: (1) that the fever does not abate when the eruption appears, and (2) that the disease is not more severe because the eruption is plentiful or early. The character of the eruption, after the first day, will serve to remove all doubt regarding these two diseases; and the comparative prevalence of either disease in the neighborhood will assist in diagnosis. It is distinguished from scarlet fever (q.v.) or scarlatina (1) by the presence at the outset of catarrhal symptoms, which do not occur in the latter disease, at any rate, prior to the eruption; (2) by the absence of the throat affection, which always accompanies well-marked cases of scarlet fever; (3) by the character of the rash, which in measles presents somewhat the tint of the raspberry and in scarlet fever that of a boiled lobster; which in measles appears in patches and in scarlet fever is universally diffused.

In ordinary uncomplicated measles the prognosis is favorable. The chief danger is from broncho-pneumonia, and in feeble children it often leaves chronic bronchial mischief behind it. No age is exempt from the disease, but it is much more common in childhood than subsequently, a second attack being comparatively rare.

In mild forms of the disease nothing more is requisite than to keep the patient on a low diet, attend to the bowels, and prevent exposure to cold, which is best accomplished by keeping him in bed with the ordinary warmth to which he is accustomed in health. If pulmonary complications appear they must be treated according to their nature. Bronchitis (q.v.), sometimes extending into pneumonia (q.v.), is most to be feared. If the eruption is delayed or disappears prematurely, it may sometimes be brought back by placing the patient in a warm bath. In such cases stimulants are often required. The patient must be carefully protected from exposure to cold for a week or two after the

disease has apparently disappeared, as the lungs and mucous coat of the bowels are for some time very susceptible to inflammatory attacks.

Except for the lesions of the skin there are no characteristic pathological changes in measles. As in other infectious diseases, degenerations in the internal organs, especially in the kidneys, are not uncommon. Otitis media, catarrhal or purulent, is a frequent complication. The process may extend to the mastoid cells, necessitating operation; or a chronic running ear may be left, with partial destruction of the drum and varying degrees of deafness.

Measles is looked upon by the laity as a mild affection, but when it is considered that between 12,000 and 15,000 deaths occur from it every year in the United States, this attitude is hardly justified. The mortality in different epidemics varies between 3 and 50 per cent. Among the well-cared-for and vigorous children of the better classes the disease is not severe, but among the poor, and especially in children living in charitable institutions, it is a veritable scourge. The younger the child, the worse the prognosis. There is a malignant type of the disease, called hemorrhagic, or "black" measles, characterized by a continuously high temperature (107°–109° F.) and subcutaneous hemorrhages, which is almost invariably fatal. As to the specific cause of the disease nothing is definitely known. Canon and Rielicke in 1892 reported the discovery in 14 cases of measles of a peculiar bacillus found in the blood, more rarely in the catarrhal exudate, which they considered specific. These observations as yet lack confirmation. The specific agent, which is believed to be an ultramicroscopic organism, has not been isolated. Consult Henry Koplik, *Diseases of Infancy and Childhood* (3d ed., New York, 1910), and John Ruhräh, *A Manual of the Diseases of Infancy and Childhood* (4th ed., Philadelphia, 1914).

MEASLES, French or German. See German Measles.

MEAS'URE (OF., Fr. *mesure*, from Lat. *mensura*, measure, from *metiri*, to measure). In music, the smallest metrical division of a movement or piece, represented by the notes or rests comprised within two successive bars of the staff. The time value of a measure is a fixed unit, depending on the character of the time which governs the movement. See Musical Notation, *The Bar*.

MEASURE FOR MEASURE. A comedy by Shakespeare, produced in 1604, printed in 1623. The plot is found in Cinthio's "Hecatommithi," in the romance and tragedy *Epitia*. It was used by G. Whetstone in his play *Promos and Cassandra* (1578) and in his prose tales *Heptameron of Civill Discourses* (1582). If Shakespeare used that version, he took from it merely the outline, and may have known the original. The play belongs to the period of *Othello*, *Hamlet* (the revised), and *King Lear*, which Darmesteter calls his pessimistic period. Though called a comedy, it is gloomy, brightened only by the character of Isabella. After the Restoration it was revised and altered by D'Avenant as *The Law against Lovers* (1662), and later adapted by Gildon (1700).

MEAS'UREMENT of Ships for Tonnage. The measurement of ships to determine their tonnage (q.v.) is now made in practically the same way by all maritime nations. The old rule in the United States was established by Act of Congress in 1799. This provided that the tonnage should be ascertained as follows: from the extreme length in feet deduct three-fourths the breadth; multiply the remainder thus obtained by the breadth and this product by the depth; divide the last product by 95 and the quotient was the register tonnage for payment of dues. In this rule the depth of a double-decked vessel was arbitrarily assumed as one-half the breadth, so that it was to the interest of shipowners to build deep ships without much regard to the effect of the deepening upon other qualities. In Great Britain a somewhat similar rule obtained. The square of the breadth was multiplied by the inboard length and the product divided by 94. This rule had the same effect on ship construction as that of the United States; and the rule is still sometimes employed in yacht and pleasure-boat measurement. Tonnage so obtained is designated as old measurement; thus, 320 tons (O.M.).

In 1835, through the efforts of Mr. Moorsom, an Act of Parliament provided for a more accurate determination of the tonnage of vessels. Instead of a thumb rule which might be—and usually was—very much in error, the measurement of the cubic contents of vessels was effected in accordance with Newton's theorem for the determination of contents of solids bounded by irregular surfaces. This act was followed by the Merchant Shipping Act of 1854, which is the basis of the present practice throughout the maritime world, though some of its provisions have been modified in England as well as elsewhere.

The method of measuring prescribed in this act and subsequent amendments is as follows: measure the length of the ship on the tonnage deck from the inside of the planking or plating at the extreme forward end at the stem to the inside of the planking or plating at the extreme after end at the stern, and deduct the rake of bow and stern in the thickness of the deck so as to reduce the measurement to the length of the ship at the underside of the deck or tops of the beams. This is the "length on the tonnage deck," which deck is the upper one in all ships which have less than three decks and second deck from below in all others. Divide the length obtained as follows: in ships which have a length on the tonnage deck of 50 feet, this length is divided into 4 equal parts; a length of 50 to 120 feet, into 6 equal parts; 120 to 180 feet, into 8 equal parts; 180 to 225 feet, into 10 equal parts; and over 225, into 12 equal parts. The division marks being established, ascertain the depth at the midship division mark; if it exceeds 16 feet, divide it into 7 equal parts; if 16 feet or less, into 5 equal parts. Measure the inside breadth of the ship at each mark and at the upper part of the depth and number them from top to bottom; multiply the second and fourth by 4 and the third by 2; add these products together and to the sum add the first and fifth; multiply the total by one-third the common interval between the breadths and this product will be deemed the transverse area of the upper part of the section. Divide the lower breadth (between the inner bottom, or upper side of double bottom, and the lower division line) into four parts by equally spaced transverse horizontal lines, measure the breadth at the four new points and at the top of the inner bottom, and proceed as before. The sum of the two areas thus deter-

mined is the total transverse area at the point. The transverse areas at the different points (4, 6, 8, 10, or 12 in number) in the length of the ship being determined, they are to be numbered from forward (or aft, either will do), the forward one being at the extreme forward end of the measured length and the other at its extreme after end. Multiply the second and every even-numbered area (except the last) by 4, and the third and every odd-numbered area (except the first) by 2; add these products together, and to the sum add the first and last if they yield anything; multiply the sum so obtained by one-third the common interval between the areas, and the product will be the cubic contents of the ship below the tonnage deck. Add to this the cubic contents of all inclosed spaces above the tonnage deck, including poop, forecastle, deckhouses, between decks, etc. From the total so obtained the following deductions are made: 1. Space exclusively occupied by the crew and the storage of their clothing, etc.; provided that this space does not exceed 20 per cent of the remaining tonnage of the ship; if it is greater than 20 per cent the excess is to be considered as part of the tonnage space. 2. Space framed in above the upper deck for machinery or for admission of light or air. 3. In vessels propelled wholly by sails, any space set apart and used exclusively for stowage of sails, if not exceeding 2½ per cent of the tonnage of the ship. 4. Any space used exclusively for the accommodation of the master. 5. Any space used exclusively for the working of the helm or of anchor gear or for keeping charts, signals, instruments of navigation, and boatswain's stores. 6. Space occupied by donkey engine and boiler if connected with main pumps of ships. 7. Double bottom when not available for cargo, stores, or fuel. 8. Actual engine room and fire room, including shaft alley, but omitting all space not occupied by engines and boilers or necessary for working them. When the actual engine and fire rooms occupy in paddle vessels 20 to 30 per cent of the gross tonnage the deduction is to be 37 per cent of gross tonnage; when the engine and fire rooms occupy 20 per cent or less the deduction may be 37 per cent of the gross tonnage, or 1½ times the actual engine and fire-room space, the option resting with the board of trade; when the space occupied by the propelling machinery, etc., exceeds 30 per cent of the gross tonnage the deduction to be made is 37 per cent of it, or 1½ times the actual engine and fire-room space, the option remaining with the owners. In the case of screw steamers when the space occupied by the machinery and boilers is 13 to 20 per cent of the gross tonnage the deduction is 32 per cent of that tonnage; when the space occupied is 13 per cent or less the deduction is 32 per cent of the gross tonnage, or 1¾ times the actual space, the option remaining with the board of trade; when the space occupied is 20 per cent or more the deduction is 32 per cent or 1¾ times the actual space, at the option of the owners.

The total additions and deductions to the tonnage space having been made, the capacity in cubic feet so obtained is divided by 100, and the result is the *register tonnage* (or *net register tonnage*) of the ship. The *gross register tonnage* is obtained by dividing by 100 the total capacity of the hull and deckhouses without deductions.

When, owing to the presence of cargo or other reason, it is impracticable to measure a vessel as heretofore described, the tonnage is determined as follows: Pass a chain around the hull at the midship section and measure the length under the bottom from the upper deck at one side to the upper deck at the other. Call this the *girth*. Add one-half the girth to one-half the main breadth; square the sum so obtained and multiply the result by the length of the ship from outside the stem to outside the sternpost; multiply this product by .0018 for wooden ships and by .0021 for those built of iron or steel.

By the Act of Congress of May 6, 1864 (taking effect Jan. 1, 1865), the United States adopted the English system with slight changes in details which are thought to conduce to greater accuracy. This act has been supplemented by several others, notably that of March 2, 1895, which makes the American practice almost identical with the English; indeed, the wording of the law is generally the same throughout. In measuring, however, the United States law divides vessels into six classes according to length, and the divisions in each class for measurement of transverse areas are: In Class 1 (vessels under 50 feet length on the tonnage deck) the length is divided into 6 equal parts; in Class 2 (vessels 50 to 100 feet long), 8 equal parts; in Class 3 (vessels 100 to 150 feet long), 10 equal parts; in Class 4 (vessels 150 to 200 feet long), 12 equal parts; in Class 5 (vessels 200 to 250 feet long), 14 equal parts; in Class 6 (vessels over 250 feet long), 16 equal parts. The method of measuring and computing net and gross tonnage is the same as that already described. Two other differences exist. One is the omission from the American act of that paragraph of the British law which provides for the measurement of deck cargoes and adds to the tonnage (for the purpose of determining tonnage taxes) all uncovered or other space occupied by deck cargo. The second point of difference relates to shelter-deck spaces and arises from a provision in section 4151, Revised Statutes (Act of Feb. 28, 1865), by which no part of any vessel used for "cabins or staterooms, and constructed entirely above the first deck which is not a deck to the hull" is to be measured. This provision seems to have been designed to meet the exceptional conditions of light-draft boats on the western rivers; but as this fact is not stated in the act, the procedure has been applied to all vessels.

The British system of measurement was also adopted by the following countries on the dates given: Denmark, 1867; Austria-Hungary, 1871; Germany, 1873; France, 1873; Italy, 1873; Spain, 1874; Sweden, 1875; Netherlands, 1876; Norway, 1876; Greece, 1878; Russia, 1879; Finland, 1877; Haiti, 1882; Belgium, 1884; Japan, 1884. In some of these the allowance of deductions, particularly that for propelling machinery, differs somewhat from the British rule. The regulations for the measurement of tonnage of vessels passing through the Panama Canal are similar to those for the Suez Canal. The deductions for space occupied by the propelling power and coal bunkers are made according to the so-called "Danube rule" and are considerably less than those provided by the United States, British, German, and French laws. The average difference of the two classes of measurement is about 10 per cent of the gross tonnage. See TONNAGE; PANAMA CANAL.

The most comprehensive and authoritative

treatise on the subject of the measurement of vessels is the report of Prof. Emory R. Johnson, of the Isthmian (Panama) Canal Commission. For further information, consult: *Instructions to Measuring Surveyors* (London, 1891); *Lloyd's Seaman's Almanac* (ib., 1893); *Revised Statutes of the United States*, sec. 4153; and the *Supplements to the Revised Statutes*, also the *Statutes at Large* for 1895. The *Instructions to Measuring Surveyors* gives all the British acts complete with instructions for carrying them into effect, definitions, etc.

MEASUREMENT OF BASE LINES. See GEODESY.

MEASURE OF DAMAGES. The rule of law determining the amount of money which a person whose rights have been infringed is entitled to recover from the wrongdoer as compensation or reparation for the wrong sustained. As damages technically covers only pecuniary compensation, the measure of damages does not include such remedies as the restitution of property, real or personal, which is unlawfully withheld from the one entitled thereto, nor the remedies peculiarly appropriate to equity, as injunction, account, foreclosure of mortgage, etc. The basis of the measure of damages is compensation, as closely as that can be arrived at, for the actual loss sustained by the injured party, but this is often difficult to estimate, as in actions for breach of promise to marry or for the alienation of the affections of a husband or wife, or in that numerous class of cases where mental suffering or injury to the feelings may be reckoned in assessing damages, as well as in cases of willful or malicious wrongdoing where vindictive or punitive damages may be awarded in addition to such as are purely compensatory. While the actual amount of the damages to be recovered in a given case usually rests in the discretion of the jury trying the question, the rules of law fixing the measure of damages which the jury is entitled to award are laid down by the court or judge. For a violation of the rule so prescribed, the verdict of the jury should be set aside and a new trial ordered. See CONTRACT; COURT; DAMAGES; JURY; TORT.

MEASURES. See WEIGHTS AND MEASURES.

MEASURING WORM. Any one of the larvæ of the lepidopterous superfamily Geometridæ, also called loopers. The group is a very extensive one and consists of fragile moths with comparatively large wings. The caterpillars are long and slender, with only one pair of abdominal feet placed upon the ninth segment of the body. There is also an anal pair of feet which function as claspers. The measuring worms walk by moving these two pairs of feet up to the thoracic legs, so that the body forms a large loop, giving the insect the appearance of measuring the surface upon which it is walking. It is this habit which has given the popular names "loopers," "inchworms," etc., and the scientific name Geometridæ to the insects of this group. Measuring worms feed upon the leaves of plants, with the exception of a few which bore into seeds. They are usually protectively colored so as to resemble twigs, and they have the attitude when at rest of holding the body stiff and erect at an angle from the main stem of the plant, so that they almost perfectly resemble twigs. The individuals of the same species vary in color during life, and with some species there is a well-marked dimorphism. In some species the dimorphism is potential, and the future color is settled by some condition occurring during the early life of the larva. Poulton has made a careful study of the attitudes and colors of these larvæ, and rates the value of their protecting influence at a very high point. In one variable English species he states that the dark tint is due to pigment in the skin or immediately below it and the green color to a layer of fat between the hypodermis and the superficial muscles. In some geometrids the adult females are wingless. A marked example of this group is seen in the cankerworm moths of the United States. (See CANKERWORM.) The winter moth (*Cheimatobia brumata*), a species which is common and widespread in Europe and North America, has also a wingless female. One of the currant worms common to Europe and North America (*Eufitchia ribearia*) is a member of this group in which the female is fully winged.

Certain moths of the noctuine series exist whose larvæ lack certain of the middle prolegs and which therefore walk in a looping or measuring manner, but these are not true measuring worms. The cotton caterpillar (*Aletia xylina*) is an example.

Consult: A. S. Packard, "A Monograph of the Geometrid Moths or Phalænidæ of the United States," in Hayden's *Annual Report of the United States Geological Survey*, vol. x (Washington, 1876); Edwards, *Standard Natural History*, vol. ii (Boston, 1884); David Sharp, *Cambridge Natural History*, vol. vi (London, 1899); J. H. and A. B. Comstock, *Manual for the Study of Insects* (8th ed., Ithaca, N. Y., 1909).

MEAT (AS. *mete*, Icel. *matr*, *mata*, Goth. *mats*, OHG. *maz*, meat, Ger. *Mass-leid*, aversion to meat). The flesh of animals used as food. Sometimes the word is restricted to the domestic animals, cattle, sheep, pigs, while the term "game" is applied to the flesh of wild animals, and "poultry" to the flesh of domestic fowl. The meat industry is one of very great importance. According to the most reliable data, there were in 1910 on farms and ranches in the United States over 40,000,000 cattle other than dairy cows. (This was only 82 per cent of the number reported in 1900, although this apparent fall was due in part to the fact that the census of 1910 was taken at an earlier date than that of 1900.) In 1909 there were slaughtered nearly 14,000,000 beef cattle, over 6,500,000 calves, 52,000,000 swine, more than 14,500,000 sheep, and some goats, the estimated weight of the dressed carcasses, including the lard of swine, being over 167,000,000 hundredweights.

Meat, i.e., flesh food, consists of the muscular tissue, or lean, and the varying quantities of fat which are found in the different parts of the carcass between and within membranes and tendons. Besides the fat ordinarily visible there is always present more or less of fat in particles too small to be readily distinguished from the lean which surrounds it. These particles can, however, be readily obtained by chemical methods in quantities sufficient to be seen and weighed. The lean part of the meat has practically the same final structure, regardless of its kind and source. All muscular tissue is made up of prism-shaped bundles, which can be divided into smaller and smaller bundles, until finally the muscle fibres or tubes are reached. These irregular tubes vary in diameter from $\frac{1}{1000}$ to $\frac{1}{200}$ of an inch, and are therefore invisible to the

unaided eye. They are held together in bundles by means of connective tissue between and inside which the invisible fat is stored. The envelope or wall of each tube is a very delicate, elastic membrane, composed of nitrogenous material. The walls themselves are comparatively permanent, but their contents are continually undergoing change and renewal.

Meat is very commonly eaten fresh, but large quantities are also salted, smoked, dried, and canned. The meats found in the markets consist of the lean or muscular tissue, connective tissue, or gristle, fatty tissue, blood vessels, nerves, bone, etc. No general statement can be made with regard to the proportion in which these substances occur, as it is found to vary greatly with the kind of animal, with different cuts from the same animal, and with many other conditions. Nearly all meats bought and sold in the markets contain portions not suitable for eating, which may be properly designated as refuse.

Cuts of Meat. The methods of cutting carcasses of beef, veal, mutton, and pork into parts, and the terms used for the different cuts as these parts are commonly called, vary considerably in different localities. The figures for composition quoted below apply in general to cuts as indicated by the accompanying diagrams. These show the positions of the different cuts, both in the live animal and in the dressed carcass as found in the markets. The lines of division between the different cuts will vary slightly according to the usage of the local market, even where the general method of cutting is as here indicated. The names of the same cuts likewise vary in different parts of the country. Thus, the part nearest the ribs of beef is frequently called small end of loin or short steak. The other end of the loin is called hip sirloin or sirloin. Between the short and the sirloin is a portion quite generally called the tenderloin, for the reason that the real tenderloin, the very tender strip of meat lying inside the loin, is found most fully developed in this cut. "Porterhouse steak" is a term frequently applied to either the short steak or the tenderloin. It is not uncommon to find the flank cut so as to include more of the loin than is indicated in the accompanying figures, in which case the upper portion is called flank steak. The larger part of the flank and the rump is very frequently corned, or pickled in brine. In some markets the rump is cut so as to include a portion of the loin, which is then sold as rump steak. The portion of the round on the inside of the leg is regarded as more tender than that on the outside and is frequently preferred to the latter.

The general method of cutting up a side of beef is illustrated in Figs. 1 and 2, which show the relative positions of the cuts in the animal and in a dressed side.

The method of cutting up a side of veal differs considerably from that employed with beef. This is illustrated by Figs. 3 and 4, which show the relative positions of the cuts in the animal and in a dressed side.

Figs. 5 and 6 show the relative positions of the cuts in a dressed side of mutton or lamb and in a live animal.

The method of cutting up a side of pork differs considerably from that employed with other meats. A large portion of the carcass of a dressed pig consists of almost clear fat. This furnishes the cuts which are used for salt pork and bacon. Figs. 7 and 8 illustrate a common method of cutting up pork, showing the relative positions of the cuts in the animal and in the dressed side. The hams and shoulders are more frequently cured, but are also sold as fresh pork steak. The tenderloin proper, which is not indicated in the figure, is a comparatively lean and very small strip of meat lying under the bones of the loin and usually weighing less than a pound. In cutting up pork some fat is usually trimmed off from the hams and shoulders, which is called ham and shoulder fat and is often used for sausages, etc. What is called leaf lard is made from the leaf fat of the peritoneum and the fat about the kidneys and along the belly.

The table on page 305 shows the average composition of a number of kinds and cuts of meat and also that of a number of meat products.

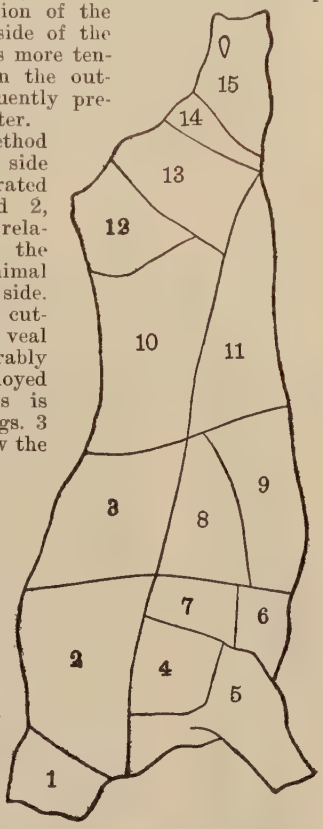


Fig. 2. DRESSED SIDE OF BEEF.

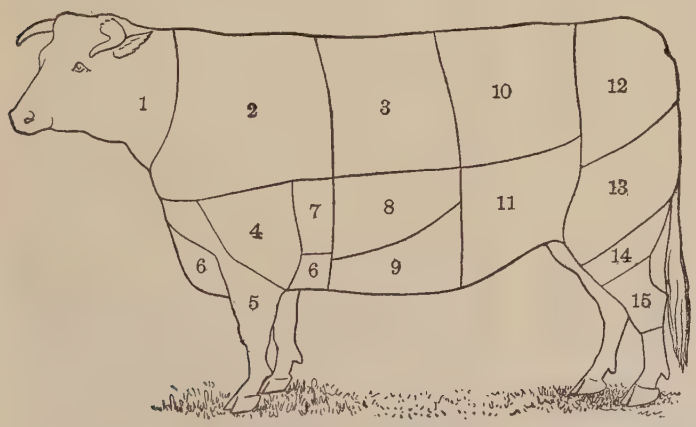


Fig. 1. DIAGRAM OF CUTS OF BEEF (live animal).

1, neck; 2, chuck; 3, ribs; 4, shouldered clod; 5, fore shank; 6, brisket; 7, cross ribs; 8, plate; 9, navel; 10, loin; 11, flank; 12, rump; 13, round; 14, second cut round; 15, hind shank.

The amount of refuse, chiefly bone, in meat as purchased, varies greatly with the different

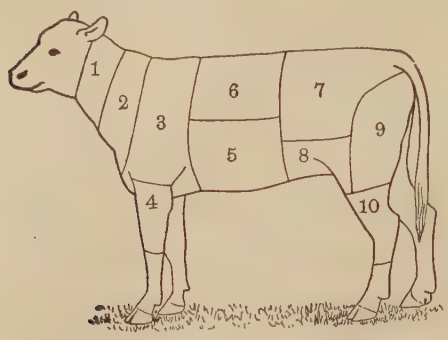


FIG. 3. DIAGRAM OF CUTS OF VEAL.
1, neck; 2, chuck; 3, shoulder; 4, fore shank; 5, breast; 6, ribs; 7, loin; 8, flank; 9, leg; 10, hind shank.

cuts. Judged by the averages of a large number of analyses, it ranges in beef from nothing in tenderloin to about 58 per cent in lean hind shank; in veal, nothing in flank to 63 per cent in medium-fat hind shank; in lamb, from 7 per cent in very fat hind leg to 20 per cent in shoulder; in mutton, from about 10 per cent in medium-fat flank to about 28 per cent in medium-fat neck; and in pork, from about 1 per cent in fresh lean ham to 68 per cent in the head. It would perhaps not be incorrect to say that, considering all meats, the refuse averages from 15 to 20 per cent of the material as purchased.

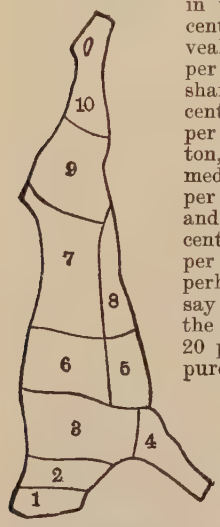


FIG. 4. DRESSED SIDE OF VEAL.

Digestibility. According to the results of a large number of experiments with beef, veal, mutton, and pork, at least 98 per cent of both the protein and the fat of meat is digested. No significant differences were observed with different cuts or different methods of cooking.

Texture (Toughness) of Meats. Whether meats are tough or tender depends upon two

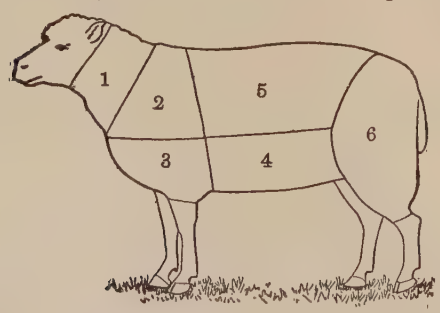


FIG. 5. DIAGRAM OF CUTS OF MUTTON OR LAMB IN THE LIVE ANIMAL.
1, neck; 2, chuck; 3, shoulder; 4, flank, 5, loin: 6, leg.

things—the character of the walls of the muscle tubes and the character of the connective tissues which bind the tubes and muscles together. In young and well-nourished animals the tube walls are thin and delicate and the connective tissue is small in amount. As the animals grow older or are made to work (and this is particularly true in the case of poorly nourished animals) the walls of the muscle tubes and the connective tissues become thick and hard. This is the reason why the flesh of young, well-fed animals is tender and easily masticated, while the flesh of old, hard-worked, or poorly fed animals is often so tough that prolonged boiling or roasting seems to have but little effect on it.

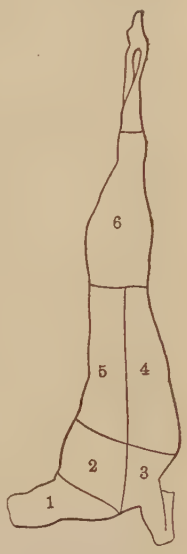


FIG. 6. DRESSED SIDE OF MUTTON OR LAMB.

After slaughtering, meats undergo marked changes in texture. These changes can be grouped under three classes or stages. In the first stage, when the meat is just slaughtered, the flesh is soft, juicy, and quite tender. In the next stage the flesh stiffens and the meat becomes hard and tough. This condition is known as *rigor mortis* and continues until the third stage, when the first changes of decomposition set in. In hot climates the meat is commonly eaten in either the first or second stage. In cold climates it is seldom eaten before the second stage, and generally, in order to lessen the toughness, it is allowed to enter the third stage, when it becomes soft and tender and acquires added flavor. The softening is due in part to the formation of lactic acid, which acts upon the connective tissue. The same effect may be produced, though more rapidly, by macerating the meat with weak vinegar. Meat is sometimes made tender by cutting the flesh into thin slices and pounding it across the cut ends until the fibres are broken.

The flavor depends largely upon the kinds and amounts of nitrogenous extractives which the muscle fibres or tubes contain. Pork and mutton are deficient in extractives, and what flavor they possess is due largely to the fats contained in them. The flesh of birds and of most game is very rich in extractives, which accounts for its high flavor. In general, the flavor of any particular meat is largely modified by the condition of the animal when slaughtered, and by its food, age, breed, etc. The flesh of young animals is more tender than, but not so highly flavored as, that of more mature animals. It is often said that the flesh of males is more highly flavored than that of females. There are at least two exceptions to this rule, since the flesh of the goose is more highly flavored than that of the gander, and in the case of pork there is little difference between the flesh of the male and that of the female. Castration, as illustrated in the familiar example of the capon, tends to make the flesh more tender, fatter, and better flavored. The flesh of the animals which feed exclusively upon fish or flesh has a strong, disagreeable taste, and is eaten only by uncivilized people or those in great need. Fish is an exception to the rule, however. Meat which is allowed to hang and ripen develops added flavors. In the first stages

of decomposition compounds quite similar to the nitrogenous extractives are formed, and it is to these that the improved flavors are due.

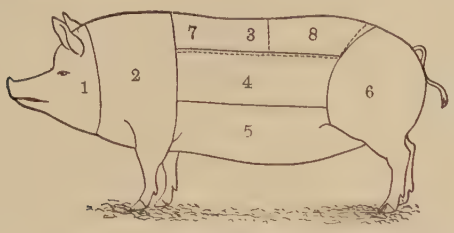


FIG. 7. DIAGRAM OF CUTS OF PORK.

1, head; 2, shoulder; 3 back; 4, middle cut; 5, belly; 6, ham; 7, ribs; 8, loins.

Characteristics of Good Meat. Meat should have little or no odor and should be without any cadaveric smell characteristic of diseased or decomposing flesh. It should have a uniform color, neither abnormally pale nor inclined to purplish, and should be firm and elastic without pitting or crackling on pressure. The surface of the meat should be just sufficiently moist to be detected, and the longer it is kept the drier it should become. There should be no evidence of any diseased condition, injury, or the presence of parasites.

Cattle. The meat of steers, which animals furnish the prime grade of beef, is very light red and of fairly firm consistency, while the fat is also firm and white in color and so dispersed through the muscle bundles as to give the much-sought-for marbled appearance. The flesh of bulls is dark red, coarse, and stringy, and contains but small quantities of fat between the muscle fibres. In old cows the meat is tough, and the fat, which is principally deposited under the skin, is yellowish and not so firm in consistency. The carcasses of fat heifers are practically indistinguishable from the carcasses of steers.

Calves. This meat is very pale, being almost white in milk-fattened animals, but is rather tough, while the fat is reddish white shortly after slaughter, gradually changing to pure white. It is soft in comparison to beef fat. The meat of calves has a characteristic odor.

"Monkey" or "bob" veal is a term applied to the carcasses of calves slaughtered during the first three or four weeks of life. It is soft and moist, the muscles are friable and poorly developed, and the fat is flabby and jelly-like and disagreeable to look upon.

Sheep. Mutton is light red in color and has a characteristic sheepy odor, while the fat is pure white and odorless. In well-fed animals the fat is abundant, especially about the kidneys and

AVERAGE COMPOSITION OF A NUMBER OF CUTS OF MEAT AND MEAT PRODUCTS

	Refuse	Water	Protein *	Fat	Total carbohydrates	Ash	Fuel value, per pound
BEEF, FRESH	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Calories*
Chuck, including shoulder, edible portion	...	65.0	19.2	15.4	...	0.9	1,005
Loin, porterhouse steak, edible portion	...	60.0	21.9	20.4	...	1.0	1,270
Loin, sirloin steak, edible portion	...	61.9	18.9	18.5	...	1.0	1,130
Round, edible portion	...	67.8	20.9	10.6	...	1.1	835
Rump, edible portion	...	57.0	18.7	23.1	...	0.9	1,325
Forequarter, as purchased	20.6	49.5	14.4	15.1	...	0.7	905
Hindquarter, as purchased	16.3	52.0	16.1	15.4	...	0.8	950
VEAL, FRESH							
Breast, edible portion	...	68.2	20.3	11.0	...	1.1	840
Chuck, edible portion	...	73.8	19.7	5.8	...	1.0	610
Leg, cutlets, edible portion	...	70.7	20.3	7.7	...	1.1	705
Forequarter, as purchased	24.5	54.2	15.1	6.0	...	0.7	535
Hindquarter, as purchased	20.7	56.2	16.2	6.6	...	0.8	580
LAMB, FRESH							
Breast, or chuck, edible portion	...	56.2	19.1	23.6	...	1.0	1,350
Loin, without kidney and tallow, edible portion	...	53.1	18.7	28.3	...	1.0	1,540
Forequarter, as purchased	18.8	44.7	14.9	21.0	...	0.8	1,165
Hindquarter, as purchased	15.7	51.3	16.5	16.1	...	0.9	985
MUTTON, FRESH							
Chuck, edible portion	...	48.2	14.6	36.8	...	0.8	1,825
Flank, edible portion	...	42.7	14.9	42.6	...	0.7	2,065
Leg, hind, edible portion	...	63.2	18.7	17.5	...	0.8	1,085
Loin, without kidney or tallow, edible portion	...	47.8	15.5	36.2	...	0.8	1,815
Forequarter, as purchased	21.2	41.6	12.3	24.5	...	0.7	1,265
Hindquarter, as purchased	17.2	45.4	13.8	23.2	...	0.7	1,235
PORK, FRESH							
Chuck, ribs, and shoulder, edible portion	...	51.1	17.3	31.1	...	0.9	1,635
Flank, edible portion	...	59.0	18.5	22.2	...	1.0	1,280
Head, edible portion	...	45.3	13.4	41.3	...	0.7	1,000
Head cheese, edible portion	...	43.3	19.5	33.8	...	3.3	1,790
Ham, fresh, edible portion	...	50.1	15.7	33.4	...	0.9	1,700
Loin, chops, edible portion	...	50.7	16.4	32.0	...	0.9	1,655
POULTRY AND GAME							
Chicken broilers, edible portion	...	74.8	25.1	2.5	...	1.1	205
Chicken broilers, as purchased	...	43.7	12.8	1.4	...	0.7	295
Chicken, heart	41.6	72.0	20.7	5.5	...	1.4	615
Fowl, as purchased	...	47.1	13.7	12.3	...	0.7	775
Goose, young, as purchased	25.9	38.5	13.4	29.8	...	0.7	1,505
Turkey, as purchased	17.6	42.4	16.1	18.4	...	0.8	1,075
Chicken, gizzard	22.7	72.5	24.7	1.4	...	1.4	520
Plover, roast canned	...	57.7	22.4	10.2	7.6	2.1	985
Quail, canned	...	66.9	21.8	8.0	1.7	1.6	775

* In many cases the sum of the constituents does not equal 100, since no account is taken of the carbohydrates. In analyses of meat it is sometimes customary to estimate the protein as the difference between 100 and the sum of the other constituents.

beneath the skin. The meat of the males has at times a very strong so-called buck odor.

Goats. Goats' meat can usually be distinguished from mutton by its characteristic odor and the lack of deposits of fats except around the kidneys and the prominence of the bony processes.

Hogs. The meat of the hog is pale red, some parts being white with usually pure-white fatty tissue, although this varies somewhat with the food and breeding. Upon cooling the meat becomes white. In old hogs the meat is redder and tougher and the subcutaneous accumulation of fat is not so marked. The meat of old boars has an extremely offensive odor, especially noticed during cooking.

Cooking. Meat is not often eaten raw by civilized people. For the most part it is either roasted, broiled, fried, stewed, or boiled. Among the chief objects of cooking are the loosening and softening of the tissues, which facilitate digestion by exposing them more fully to the action of the digestive juices. Another important object is to kill parasites and microörganisms if present, and thus destroy organisms that might otherwise expose the eater to great risks. Minor, but by no means unimportant, objects are the coagulation of the albumen and blood so as to render the meat more acceptable to the sight, and the development and improvement of the natural flavor, which is often accomplished in part by the addition of condiments.

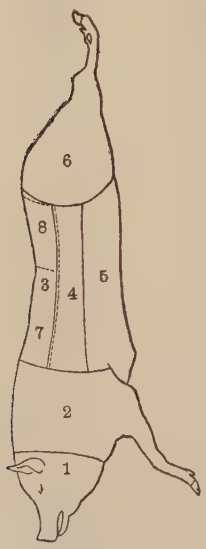


FIG. 8. DRESSED SIDE OF PORK.

If meat in cooking is placed in cold water and heated gradually, part of the organic salts, the soluble albumen, and the extractives or flavoring matters will be dissolved out. The broth or soup obtained will be rich, but the meat will be correspondingly tasteless. This tasteless material has been found to be as easily and completely digested as the same weight of ordinary roast. It contains nearly all the protein of the meat, and, if it is properly combined with vegetables, salt, and flavoring materials, makes an agreeable as well as nutritious food. If a piece of meat is plunged into boiling water, the albumen on the entire surface of the meat is quickly coagulated, and the enveloping crust thus formed resists the dissolving action of water and prevents the escape of the juices and flavoring matters. Thus cooked, the meat retains most of its flavoring matters and has the desired meaty taste. The resulting broth is correspondingly poor.

Theoretically, the principal difference between roasting or baking and boiling is the medium in which the meat is cooked. In boiling, the flesh to be cooked is surrounded by boiling water; in roasting, by hot air, although in roasting proper much of the heat comes to the joint as "radiant" heat. In both cases, if properly conducted, the fibres of the meats are cooked in their own juices.

It is interesting and at the same time important to remember that the smaller the cut to be roasted the hotter should be the fire and the shorter the period of cooking. A very hot fire coagulates the exterior and prevents the drying up of the meat juices. This method would not, however, be applicable to large cuts, because meats are poor conductors of heat, and a large piece of meat exposed to this intense heat would become burned and changed to charcoal on the exterior long before the heat could penetrate to the interior. The broiling of a steak or a chop is done on exactly this principle. An intense heat should be applied to coagulate the albumen thoroughly and stop the pores and thus prevent the escape of the juices.

Experiments on the losses in cooking meat lead to the following deductions: The chief loss in weight during the cooking of meat is due to the driving away of water. When beef is pan broiled there appears to be no great loss of nutritive material; but when it is cooked in water from 3 to 20 per cent of the total solids is found in the broth. Beef which has been used for the preparation of beef tea or broth has lost comparatively little nutritive value, though much of the flavoring material has been removed. The amount of fat found in the broth varies directly with the amount present in the meat—i.e., the fatter the meat the larger the quantity in the broth. The amount of water lost during cooking varies inversely as the fatness of the meat—i.e., the fatter the meat the less the shrinkage in cooking. In cooking in water the loss of constituents is inversely proportional to the size of the piece of meat. In other words, the smaller the piece the greater the percentage of loss. The loss appears to depend upon the length of time of cooking. When meat in pieces weighing from one and one-half to five pounds is cooked in water at 80° to 85° C. (175° to 185° F.) there appears to be little difference in the amount of material found in the broth whether the meat is placed in cold water or in hot water at the start.

Since meat nutrients are principally protein and fat, a considerable amount of carbohydrate foods (bread and other cereals, vegetables, fruits, etc.) are eaten with the meats to form a well-balanced diet. According to the results of a large number of dietary studies, beef and veal together furnished 10.3 per cent of the diet of the average American family, mutton and lamb 1.4 per cent, pork 5.4 per cent, and poultry 1.1 per cent of the total food; beef and veal 24.6, mutton and lamb 3.3, pork 8.8, and poultry 2.6 per cent of the total protein, and 19.5, 3.8, 30, and 1.2 per cent respectively of the total fat.

Export Trade in Meat and Abattoir Products. American export trade in animal products originated in 1876, from which time it was carried on in an ever-increasing scale until only a few years ago the United States furnished one-third the world's supply of meats. Within recent years, however, with the increase in population there has been a large increase in the demand for meat in America; while during the same period the production of cattle for slaughter has markedly decreased. The effect of this condition has been a strong decline in the exports of meat and an increase in the imports. This is particularly true of beef, the imports of which during 1912 were one and one-half times more than the exports. This comes chiefly from Canada, Mexico, and South America. Meats were imported into the United States in but comparatively small quantities prior to October, 1914, when the traffic law, which took effect October 4, admitted

fresh meats, chiefly beef, free of duty, and 197,000,000 pounds were imported between October 4 and June 30, and over 200,000,000 pounds in 1915. The exportation fell very rapidly in the decade 1904–14, especially of fresh and canned beef, but was stimulated by the European War.

(For information regarding the meat-inspection law and its enforcement by the United States Department of Agriculture, see article on PACKING INDUSTRY.)

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MEATBIRD. The Canada jay. See JAY.

MEAT EXTRACT. The term meat extract is commonly applied to a large number of preparations of very different character. They may be conveniently divided into three classes: (1) true meat extracts; (2) meat juice obtained by pressure and preserved compounds which contain dried pulverized meat, and similar preparations; and (3) albumose or peptose preparations, commonly called predigested foods. True meat extract made according to Liebig's original directions contains no gelatin, fat, or insoluble albumen; it contains only those ingredients of meat which are soluble in hot water. A standard and commercial extract has been found to consist of 58.5 per cent of organic matter, 21.5 per cent of inorganic matter (salts), and 20 per cent of water. The inorganic matter is rich in phosphates. The organic matter contains a variety of chemically complex substances, including kreatin and kreatinin (qq.v.), xanthine bases, carnine, etc. Such meat extract is valuable as a stimulant, but can by no means serve as a substitute for meat. Its strong meaty taste is deceptive, and the person depending upon it alone for food would certainly die of starvation.

True meat extract is now made on a very large scale, many million acres of land being used as pasturage for the horned cattle required by the industry, and the cattle being of the best English stocks. The steps involved in the process of manufacture are as follows: after the death of the animal the meat is hung up for several hours in cooling halls, then the fat and sinews are removed, and the meat is first chopped and then minced, by machinery, of course. The minced meat is then extracted with pure hot (but not boiling) distilled water in large open pans, the fat gradually rising to the top and being skimmed off. The aqueous extract is next concentrated by evaporation, first in the air, later in vacuum pans, two filtrations being carried out during this stage, and after being further concentrated to a thick sirupy mass, the extract is ready for distribution to the blending factories, to which it is sent in hermetically sealed 100-pound cans.

Broth and beef tea as prepared ordinarily in the household contain more or less protein, gelatin, and fat, and therefore are foods as well as stimulants. The proportion of water in such compounds is always very large. The preserved meat juice and similar preparations contain more or less protein, and therefore have some value as food. The third class of preparations is comparatively new. The better ones are really what they claim to be—predigested foods. They contain the soluble albumoses (peptoses), etc., which are obtained from meat by artificial digestion.

MEAT FLY. See FLESH FLY.

MEATH, mēth. A county of the Province of Leinster, Ireland, bounded on the east by the Irish Sea and the counties of Dublin and Louth, on the north by Monaghan, Louth, and Cavan, on the west by Westmeath and Cavan, and on the south by Dublin, Kildare, and Kings. Area, 906 square miles (Map: Ireland, E 4). The chief river is the Boyne. The soil is a rich, fertile loam, but it is devoted almost entirely to pasture, about 20 per cent being under crops. The staples are potatoes, oats, and turnips. Capital, Trim. Pop., 1901, 67,497; 1911, 65,091.

MEAUX, mô. A town of France, in the Department of Seine-et-Marne, on the right bank of the river Marne, 28 miles east of Paris (Map: France, N., H 4). Opposite is its suburb, Le Marché. It has an episcopal palace, a college, a public library, and a seminary. Bossuet, whose remains lie in the sixteenth-century cathedral of Saint-Stephen, was a bishop here for 23 years. As the centre of the Brie agricultural district it has a brisk trade in cheese, corn, eggs, and poultry; its mills supply Paris with most of its meal and corn. There are manufactures of cotton and other cloths, cheese, sugar, steel, lumber, and machinery. Meaux was the turning point of the German drive on Paris in the early months of the European War which broke out in 1914. The Germans suffered heavy losses and from here began their retreat to the Aisne. See WAR IN EUROPE. Pop. (commune), 1901, 13,690; 1911, 13,600.

MEC'CA (Ar. *Makkah*, or *Bakkah*, Koran, Sura iii, 90; called also *al Musharrifah*, the Exalted, *Umm al Kura*, mother of cities, and *al Balad al Amīn*, the safe place, known to the geographer Ptolemy as Macoraba). Capital of the Turkish Province of Hejaz in Arabia, and, through being the birthplace of Mohammed, and containing the Kaaba, the central and most holy city of all Islam (Map: Turkey in Asia, D 7). The two other principal holy cities are Medina and Jerusalem. It is in lat. 21° 28′ N. and in long. 40° 15′ E., 245 miles south of Medina, and about 65 miles east of Jiddah, its port on the Red Sea, in a narrow, barren valley, surrounded by bare hills from 250 to 800 feet high. The city is about a mile and a half long and from one-third to two-thirds of a mile wide, and is divided into the upper and lower city. An aqueduct built by Zubaidah (810), wife of Harun al Rashid, brings good water from the mountains to the east. By its position Mecca commands the trade routes connecting lower Hejaz with north, south, and central Arabia, and it has at all times been a commercial and religious centre. The streets are somewhat regular, but unpaved; dusty in summer and muddy during the rainy season. The houses are often five stories high. Some of the government buildings, the Hamidiyyah, or

palace of the Governor, the printing office, the chief watch-house, and the three armories, are in the new part of the city (*al Jiyād*) southeast of the *Harām*, or sacred precincts, and this part of the city has a European appearance. The only manufactures of Mecca are rosaries and pottery; some dyeing is also done; the inhabitants make their living chiefly by letting rooms at the time of the pilgrimage (see HAJJ) to the pilgrims who come here often to the number of 100,000. The largest number of these pilgrims are Malays and Indians; then come negroes, Persians, Turks, Egyptians, Syrians, Tatars, and Chinese. Ordinarily the city contains about 60,000 inhabitants. The centre of the city is the *Masjid al Harām*, or Sacred Mosque, which lies beneath the level upon which the rest of the city stands and is always liable to inundations from the *Sail*, or mountain torrent. This sacred area is capable of holding 35,000 people; it is surrounded by colonnades, contains the sacred Kaaba, and is the only mosque in the world with seven minarets. (See KAABA.) A great number of people are attached to the mosque in some kind of ecclesiastical capacity, as *Khātibs* (preachers), *Kātibs* (scribes), muftis, judicial assessors, muezzins, etc. In addition to this, each section of the Mohammedan world has its representatives in Mecca, who take care of its pilgrims, provide them with lodgings, instruct them in the ceremonies, and the like. By the side of the mosque runs the *Mas'ah*, a street lined by high houses and reaching up to the hills, Safa and Marwah, through which the pilgrims must run seven times. A telegraph line connects Mecca with Jiddah on the west and with Taif on the east, where the Meccans spend their summer.

The history of Mecca has been an eventful one. Mohammedan legend holds that it was inhabited by Ishmael, whose posterity was supplanted by the *Banu Jurhum* of Yemen, who in their turn were supplanted by the *Khuzā'a*, also of Yemen, in the year 210 A.D. About 450 a certain Kussaï of the Koreish family, and an ancestor of Mohammed, seized the Kaaba, and his family is supposed to reign there to-day. Here Mohammed was born (c. 570), and in the same year the city was menaced by the Abyssinians ("Year of the Elephant"). Its patricians opposed the Prophet, but gave in eight years after he had fled to Medina in 630. Though large sums of money were lavished upon it by successive Mohammedan rulers, it was not an easy city to hold. It had its own pretender to the caliphate in Abdallah ben Zobeïr, who was besieged in Mecca in 692 by the Caliph al Hajjaj and finally slain. In 930 it was devastated by the Karmathians. But it always had its own rulers or sherifs, descendants of the Prophet through Hasan, son of Ali; and, though they recognized the supremacy of the Fatimides, Mamelukes, and Turkish sultans, they had a large measure of independence. Since Selim I (1517) they have ruled in the name of the Turkish Sultan. In 1803 the Wahhabis took the city, but were driven out by Mehemet Ali in 1813. A change in the dynasty of sherifs occurred in 1827. Since 1840 their prestige has gradually diminished, a *wali* (governor) being sent by the Porte to offset their power. Though all non-Mohammedans are strictly prohibited from visiting the sacred territory, some Europeans have been there (see HAJJ, where the literature will also be found). Consult: Christian Snouck-Hurgronje, *Mekka* (The Hague, 1888–89, with atlas); Kahn and Sparroy, *With the Pilgrims to Mecca* (New York, 1905); A. J. B. Wavell, *A Modern Pilgrim in Mecca* (London, 1912).

MÉCHAIN, mā'shăn', PIERRE FRANÇOIS ANDRÉ (1744–1804). A French astronomer, born at Laon. He attracted the attention of Lalande (q.v.), who secured him a place as government hydrographer to survey the French coasts. He still, however, managed to keep up his astronomical studies, and was in 1782 elected to the Academy. In 1791, when the government had decided to use the arc of meridian between Dunkirk and Barcelona as a basis for the new metric system, he was employed to measure that portion which lies between Rodez and Barcelona. On the completion of this work he resumed his observations at Paris, but, an error having been discovered in his measurements, he returned to Spain to correct it and was there stricken with yellow fever. He contributed memoirs on eclipses and the theory of comets to the *Transactions* of the Academy of Sciences and to the *Connaissance du Temps*, of which he was editor from 1784 to 1794.

MECHAN'ICAL ADVANTAGE. See MECHANICAL POWERS.

MECHANICAL ENGINEER. See ENGINEER AND ENGINEERING.

MECHANICAL ENGINEERS, AMERICAN SOCIETY OF. An association of professional mechanical engineers, manufacturers, and professors in technical schools, organized in New York in 1880 to promote the arts and sciences connected with engineering and mechanical construction. The headquarters are in the Engineering Societies Building, 29 West 39th Street, New York, given by Andrew Carnegie to the engineering profession. Two general meetings are held yearly—the annual meeting in New York during the first week in December and the spring meeting in some other city. Local meetings are held during the year in several cities under the direction of local sections, and student branches are established in many of the technical colleges. There are five grades of membership—honorary members, chosen from those of acknowledged professional eminence; members, consisting of engineers or teachers of applied science of 32 years of age or over who have been in active practice of their profession for at least 10 years and in responsible charge of important work for five years; associates, 30 years of age or over, connected with some branch of engineering, science, or arts, and qualified to coöperate with engineers; associate members, consisting of professional engineers not less than 27 years of age who shall have been in active practice for at least six years and in responsible charge of work for at least one year; and juniors, 21 years of age or over, who must have had such engineering experience as to enable them to fill subordinate positions in engineering work, or who have graduated from a technical school of recognized standing. The society publishes a monthly journal of engineering, an annual volume of transactions, and numerous pamphlets and reports on engineering subjects. It coöperates in maintaining the Library of the Engineering Societies in New York, a free reference library, containing over 65,000 volumes of engineeering and scientific literature and receiving regularly 800 American and foreign periodicals. The membership of the society is over 6000.

MECHANICAL EQUILIBRIUM. See EQUILIBRIUM, MECHANICAL.

MECHANICAL EQUIVALENT OF HEAT. See HEAT.

MECHANICAL FLIGHT. See AËRONAUTICS.

MECHANICAL POWERS — MACHINES. Technically described a machine is a combination of resistant bodies for modifying energy and doing work, the members of which are so arranged that, in operation, the motion of any member involves definite, relative, constrained motion of the others. A brief analysis of this definition will help to make it clear. First, a machine must consist of a combination of bodies; thus, a lever must have its fulcrum, a screw its nut, a wheel and axle its bearings, and so on with other examples; the simplest machine must have at least two members between which relative motion is possible. Second, the members of a machine must be resistant in order to transmit force; they generally are rigid, but not necessarily so, since flexible belts, chains, or springs may be employed to transmit force under the particular action to which they are adapted. Third, a machine is used to modify energy and perform work. This proposition is obvious. The conception of a machine involves the conception of some source of energy and a train of mechanism suitably arranged to receive, modify, and apply the energy derived from this source to the desired end. A machine, then, consists of (1) parts receiving the energy; (2) parts transmitting and modifying the energy; and (3) parts performing the required work. Finally, (4) the relative motions of the members of a machine are constrained or restricted to certain definite, predetermined paths in which they must move, if they move at all, relatively. The first two propositions of the definition are equally true of structures (such as a bridge) as of machines, but the third and fourth are true of machines only and serve to distinguish machines from structures. A structure modifies and transmits force only, and does not permit relative motion of its members; a machine modifies and transmits force and motion, i.e., energy, and permits relative constrained motion of its members.

The distinction between a machine and a mechanism remains to be explained. A mechanism is a combination of resistant bodies for transmitting and modifying motion (not motion and force or energy as in machines) so arranged that, in operation, the motion of any member involves definite, relative, constrained motion of the other members. A mechanism does work incidentally, such as the overcoming of its own frictional resistance; its primary function is to modify and transmit motion; a mechanism or combination of mechanisms which receive energy and transmit and modify it for the performance of useful work constitutes a machine.

Machines are of various degrees of complexity, but the simple parts or elements of which they are composed are reducible to a very few. These elementary machines are called the mechanical powers, and are commonly reckoned as the lever, the inclined plane, the jointed link, or toggle joint, and the hydraulic press. All machines and all locomotor movements of animals resolve themselves into the action of one or a combination of these simple mechanical powers or machine elements. A few observations applicable to all may appropriately be made here. 1. In treating of the theory of the lever and other mechanical powers the question really examined is, not what power is necessary to move a certain weight, but what power is necessary to balance it. This once done, it is obvious that the least additional force will suffice to begin motion. 2. In pure theoretical mechanics it is assumed that the machines are without weight. A lever, for instance, is supposed to be a mere rigid line; it is also supposed to be *perfectly* rigid, not bending or altering its form under any pressure. The motion of the machine is also supposed to be without friction. In practical mechanics the weight of the machine, the yielding of its parts, and the resistance of friction have to be taken into account. 3. When the effect of a machine is to make a force overcome a resistance greater than itself it is said to give a *mechanical advantage.* A machine, however, never actually increases power—for that would be to create work or energy, a thing as impossible as to create matter. What is gained in one way by a machine is always lost in another. One pound of weight at the long end of a lever will lift 10 pounds at the short end, if the arms are rightly proportioned; but to lift 10 pounds through 1 foot it must descend 10 feet. The two weights, when thus in motion, have equal momenta; the moving mass multiplied into its velocity is equal to the resisting mass multiplied into its velocity. When the lever seems to multiply force it only concentrates or accumulates the exertions of the force. The descending one-pound weight, in the case above supposed, may be conceived as making 10 distinct exertions of its force, each through a space of 1 foot; and all these are concentrated in the raising of the 10-pound weight through 1 foot. The principle thus illustrated in the case of the lever holds good of all the other mechanical powers. 4. The object of a machine is not always to increase force or pressure; it is as often to gain velocity at the expense of force. (See LEVER.) In a factory, e.g., the object of the train of machinery is to distribute the slowly working force of a powerful water wheel or other prime mover among a multitude of terminal parts moving rapidly but having little resistance to overcome. 5. The mechanical advantage of a compound machine is theoretically equal to the product of the separate mechanical advantages of the simple machines composing it; but in applying machines to do work allowance must be made for the inertia of the materials composing them, the flexure of parts subjected to strains, and the friction, which increases rapidly with the complexity of the parts; and these considerations make it desirable that a machine should consist of as few parts as are consistent with the work it has to do. 6. The forces, or "moving powers," by which machines are driven are the muscular strength of men and animals, wind, water, electrical and magnetic attractions, heat, etc.; and the grand object in the construction of machines is with a given amount of impelling power to get the greatest amount of work of the kind required. (See WORK; FOOT POUND.) This gives rise to a multitude of problems, some more or less general, others relating more especially to particular cases—problems the investigation of which constitutes the science of applied mechanics. One of the questions of most general application is the following: if the resistance to a machine were gradually reduced to zero, its velocity would be constantly accelerated until it attained a maximum, which would be when the

point to which the impelling force is applied was moving at the same rate as the impelling force itself (e.g., the piston rod of a steam engine) would move if unresisted. If, on the other hand, the resistance were increased to a certain point, the machine would come to a stand. Now the problem is to find between these two extremes the rate at which the greatest effect or amount of work is got from the same amount of driving power. The investigation would be out of place here, but for a turbine the greatest effect is produced when the velocity of the point of application is one-half of the maximum velocity above spoken of. The moving force and the resistance should therefore be so adjusted as to produce this velocity. See MECHANICS.

MECHANICAL SENSE IN ANIMALS. In animals the simplest and most primitive form of sensory response is that to mechanical stimulation. The animal exhibits a negative or avoiding reaction to intense stimulation and a positive or accepting reaction to weaker stimuli. The flatworms, e.g., when prodded by a bristle move away, but when touched by a fine hair turn towards it. Either reaction may take more than one form. The flatworm may avoid the bristle by turning away, by hastening forward, or (in the case of violent prodding) by turning abruptly towards the bristle and beyond it. The positive reaction, when it takes the form of a tendency to remain in contact with a solid body, is frequently spoken of as thigmotaxis. Earthworms show thigmotaxis when they crawl along the corners of a box or passage in which they are placed, and their burrowing instinct undoubtedly involves the same tendency.

In its least complex form the mechanical sense is often inseparable from the chemical sense and the light sense; the reactions to mechanical, chemical, photic, and even acoustic stimuli may be identical. (See CHEMICAL SENSE IN ANIMALS; HEARING IN ANIMALS; TROPISM; VISION IN ANIMALS.) In its higher forms it becomes differentiated into the modalities of cutaneous and kinæsthetic sensibility. See KINÆSTHETIC SENSATIONS IN ANIMALS; TOUCH IN ANIMALS.

MECHANICAL TISSUE. The supporting tissue (stereome) of the plant, including not only the vascular system but also the cortical sclerenchyma and collenchyma. Cortical mechanical tissue is particularly prominent in the hypoderma of stems and leaves.

MECHANICAL UNITS. Various units or standards used in different countries and under different conditions for the expression of mechanical quantities. One system, the C. G. S. system (q.v.), is based upon the centimeter, the gram, and the mean solar second. Another uses the foot, the pound, and the mean solar second. The yard and the pound are legally defined in England as follows: "The straight line or distance between the centres of the transverse lines in the two gold plugs in the bronze bar deposited in the office of the Exchequer [London] shall be the genuine standard yard at 62° F.; the pound is the mass of a certain piece of platinum marked 'P. S. 1844, 1 pound,' and deposited at the office of the Exchequer." Both the standard yard and pound are now preserved at the Standards Office of the Board of Trade, London. In the United States the customary or Anglo-Saxon measures are referred to the Metric Standards, the yard being $\frac{3600}{3937}$ of the standard meter and the pound .4535924277 of the standard kilogram. Still another system is based upon the foot (one-third of the yard), the mean solar second, and the *weight of one pound at sea level and latitude 45°* as the unit of force. (A unit mass is given an acceleration unity by a unit force; hence, since the unit force gives per second an acceleration 32.172 feet per second to a mass of one pound, it will give an acceleration 1 to 32.172 pounds; therefore, on this system, the unit of mass is 32.172 pounds.)

The relations between these units is as follows:

1 centimeter = 0.3937 inch = 0.01093611 yard.
1 yard = 91.4402 centimeters.
1 gram = 0.00220462 avoirdupois pound = 15.4324 grains.
1 pound = 453.5924 grams.

The units for the various important mechanical quantities are derived from them. These derived units and a few others are given in the following sections:

Velocity.—One centimeter per second; one yard (or foot) per second; one nautical mile (6080 feet) per hour is called a *knot.*

Acceleration.—Unit velocity per second.

Force.—One gram with unit C. G. S. acceleration = *dyne;* one pound with unit (ft.-lb.-sec.) acceleration = *poundal* = 13,825 dynes. Weight of one pound = 444,520 dynes.

Work.—One dyne acting through one centimeter = *erg;* 10^7 ergs = *joule.* One pound raised one foot = *foot pound* = 1.356 joules. One kilogram raised one meter = *kilogrammeter* = 9.81 joules. (The last two relations are approximate.)

Power.—One joule per second = *watt;* 33,000 foot pounds per minute = *horse power* = 746 watts; force de cheval = 75 kilogrammeters per second = 736 watts.

Pressure.—One dyne per square centimeter = *barie.* One megadyne (10^6 dynes) per square centimeter = *megabarie.* Weight of one pound per square foot = 47.9 dynes per square centimeter; one poundal per square foot = 14.88 dynes per square centimeter; one centimeter of mercury = 13.5950 × 980.692 dynes per square centimeter = 13,332.5 dynes per square centimeter; hence 75 centimeters of mercury = 1 megabarie (very closely); 76 centimeters of mercury, one atmosphere = 1.0133 megabaries.

MECHANICS (Lat. *mechanica,* from Gk. *μηχανικά, mēchanika, μηχανική, mēchanikē,* mechanics, from *μηχανή, mēchanē,* device). The science which is concerned with the motion of matter: the possible kinds of motion, the conditions under which the motion remains unchanged, and those under which it changes. That branch of mechanics which discusses the possible kinds of motion is called *kinematics,* while that which discusses the properties of matter in motion is called *dynamics.* Dynamics is divided also into two parts—*statics* and *kinetics*—the former treating the conditions under which there is no change in the motion, the latter those under which there is change.

HISTORICAL SKETCH

The first mechanical problems solved were those dealing with the simple machines. Archimedes (287–212 B.C.) was acquainted with the law of the lever in its simplest form, and Leonardo da Vinci (1452–1519) stated the law for the most general case, when the forces were in any directions and applied at any points. The principle of the inclined plane was known to Galileo (1564–1642) and to Stevinus (1548–1620). Stevinus was the first to use a line to

describe a force, and to make use of the principle of the composition and resolution of forces; he also discussed the properties of pulleys and combinations of pulleys, using the principle that, if force applied to the cord (a weight) move down a certain distance, a weight fastened to the pulley must move up a distance such that the product of each weight by its distance is the same. This principle is that of virtual velocities, so called, which was applied also by Galileo, Torricelli, Bernoulli, and Lagrange. In his treatment of the inclined plane Galileo made use of the general principle that there is equilibrium in any case when the weight as a whole cannot descend farther; or, as Torricelli expressed it, when the centre of gravity cannot descend.

Galileo was the founder of the science of dynamics. He recognized the fact that, if a piece of matter were in motion and were free from external action, it would continue its motion unaltered. He proved by experiment that all bodies fall with the same acceleration towards the earth, and proposed that the value of a force's action on a body be measured by the acceleration produced. He recognized the independence of different motions in discussing the motion of a projectile. He was acquainted, too, with the general properties of a simple pendulum, especially its property of having a definite period which varied with the length of the string.

Huygens (1629–95) did fully as important work as Galileo and deserves to rank with him. He deduced the formula for centrifugal motion, $a = s^2/r$. He invented a pendulum clock and the escapement for it; he used a pendulum to determine g; and proposed a seconds pendulum as a standard of length. He solved the problem of deducing the length of a simple pendulum which would vibrate in the same period as a compound one, i.e., he determined the position of the centre of oscillation (q.v.). In this last deduction he made use of the principle that, in whatever manner the particles of a compound pendulum influenced each other, the velocities acquired in the descent of the pendulum are such that by virtue of them their centre of gravity rises just as high as the point from which it fell, whether the pendulum is considered a rigid body or as breaking up into particles each connected with the axis by a cord and thus forming a great number of simple pendulums. If p_1, p_2, etc., are the *weights* of the particles, h_1, h_2, etc., are the distances they have fallen at any instant, and s_1, s_2, etc., are their speeds at that instant. Huygens's principle leads to the relation $\frac{1}{2}p_1s_1^2 + \frac{1}{2}p_2s_2^2 + \text{etc.} = (p_1h_1 + p_2h_2 + \text{etc.})\ \frac{1}{g}$ or

$$\Sigma\tfrac{1}{2}ps^2 = \frac{1}{g}\Sigma ph.$$

In the case of a rigid body turning around a fixed axis $\Sigma\frac{1}{2}ps^2 = \frac{1}{2}\omega^2\Sigma pr^2$, where ω is the angular speed and r is the distance of the particle of weight p from the axis. Thus, Huygens was led to the use of Σpr^2 as a measure of the inertia of a rotating body. He did not, however, realize the idea of mass as distinct from weight. The name "moment of inertia" was given Σmr^2 by Euler.

Newton gave the principles of mechanics their final form, and since his day there have been no important additions to them. We owe to Newton (1642–1727) the recognition of other forces than weight, the general idea of force, and in particular the conception of inertia or mass as a property of matter distinct from its weight, the general statement of the principle of the composition and resolution of forces, and the law of action and reaction being equal but opposite. Newton adopted as the proper measure of a force the acceleration produced in a given portion of matter; or, in other words, the velocity produced in a given time. According to Huygens the measure of the force is the square of the velocity produced in a given distance. Among the philosophers who came after Newton and Huygens there was a school, following Descartes, who measured forces by the change in mv; another, following Leibnitz, who measured it by the change in mv^2. Thus, to a certain extent one school succeeded Newton; the other, Huygens. The two were shown by D'Alembert to be identical, although there was a great controversy for many years concerning their relative merits.

KINEMATICS

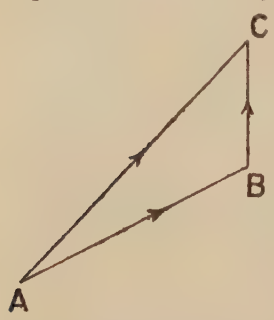
All possible motions of any geometrical figure may be divided into two classes: *translation* and *rotation*. In the former all lines in the moving figure remain parallel to themselves, i.e., the motions of all the points are identical; in the latter all the points of the figure are describing circles whose centres lie on a straight line called the axis. In the general case the motion of a figure is a combination of translation and rotation.

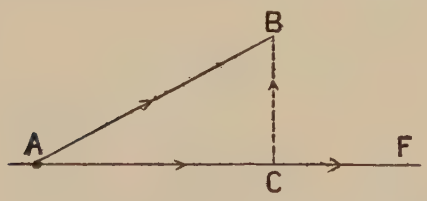
Translation. In motion of translation it is necessary to consider the motion of one point of the figure only, as that is the same for all the points. If the figure is moved from one position to another, this *displacement* may be represented by a straight line joining the initial and final positions of any one point of the figure. This line indicates by its direction and its length the displacement of the whole figure; it is called a *vector*, and displacement is said to be a *vector quantity* because it requires for its complete understanding a direction and a numerical quantity only, and so can be pictured by a straight line having the proper direction and a length equal to or proportional to the numerical quantity.

If the motion of the figure is uniform—i.e., if it passes over equal distances in equal intervals of time—the rate of motion, or the distance traversed divided by the time taken, is called the *linear speed*. If the motion is not uniform, the linear speed at any instant is the distance which the figure would move in the next second if its motion were to continue for that interval of time at exactly the same rate as it is at that instant: in mathematical symbols, if Δx is the length of the extremely short distance traversed in the extremely short interval of time Δt immediately following the given instant, the linear speed at that instant is the value of $\frac{\Delta x}{\Delta t}$ in the limit as Δt is taken smaller and smaller. Speed is therefore a number. If the speed in a particular direction is considered—i.e., if a distinction is made between the motions of figures with the same speed but in different directions—the linear speed in a given direction is called the *linear velocity* in that direction. Linear velocity is evidently a vector quantity, the linear speed giving the numerical quantity, i.e., the length of the vector.

If a figure is given simultaneously two displacements, the resulting displacement is evidently found by adding geometrically the two

components. Thus, if AB and BC represent the two component displacements, the actual one will be AC, formed by placing BC so as to continue the motion indicated by AB and completing the triangle. (A man walking across the deck of a moving ship illustrates this composition of displacements.) Similarly, if AB and BC represent the linear velocities of the two component motions, the actual velocity is represented in direction and speed by AC. In a perfectly similar manner three, four, etc., vector qualities may be added geometrically. Further, conversely, any displacement or velocity may be regarded as made up of two displacements or two velocities, the condition being that the two vectors representing the component quantities should form a broken line joining the ends of the vector representing the actual quantity. This is called "resolution" of displacement or velocity. In resolving vectors it is nearly always best to take the components so that they are at right angles to each other, for then they are independent of each other. Thus, if AB is a displacement—or any vector—its component in the direction AF is the vector AC obtained by dropping a perpendicular from B upon AF. AB is equivalent to AC and CB, but CB has no connection with the direction AF, and AC is then that component of AB which





indicates how much AB is concerned with the direction AF. In mathematical language the component in the direction AF of a vector AB is $AB\cos(CAB)$.

In general the velocity of a moving figure will not be constant, and the rate of change of the linear velocity at any instant—i.e., if Δv is the extremely small change of the velocity in the extremely small interval of time Δt, the limiting value of $\frac{\Delta v}{\Delta t}$ — is called the *linear acceleration* at that instant. It is evident that acceleration, being the change in velocity and therefore the difference between two lines, is itself a vector quantity: it has a numerical value and a definite direction, and, as with displacements and velocities, accelerations can be compounded by geometrical addition or resolved into components. Since linear velocity is characterized by a speed and by a direction, it can change in two independent ways: the speed can change, the direction remaining the same, e.g., a falling body; the direction can change, the speed remaining the same, e.g., a particle moving in a circle at a uniform rate. (In general, both speed and direction change, e.g., a vibrating simple pendulum.) There are therefore two independent types of linear acceleration. The three most interesting cases of linear acceleration are the following:

1. Motion in a straight line, constant acceleration. If the acceleration is positive, the speed increases; if it is negative, the speed decreases. Let the acceleration be called a, and the speed at any instant s_0; then, t seconds later, the speed will be $s = s_0 + at$, and the distance traversed in that time will be $x = s_0t + \frac{1}{2}at^2$. If t is eliminated from these equations, it is seen that $s^2 - s_0^2 = 2ax$. These formulæ apply to a body falling freely towards the earth, in which case $a = 980$; to a body thrown vertically upward, in which case $a = -980$; and to many other illustrations.

2. Uniform motion in a circle. If the circle has a radius r, and if the constant speed is s, the acceleration has for its numerical value $\frac{s^2}{r}$, and its direction at any instant is along the radius towards the centre from the point where at that moment the moving point is. This last fact is evident if the change in the *velocity* is considered. At any position in its path around the circle the moving point has a *velocity* along the tangent to the circle; the following instant that velocity is changed into the next tangent; and to secure this change a small vector perpendicular to the first tangent must be added to the vector representing the first velocity. The proof that the numerical value of the acceleration is $\frac{s^2}{r}$ will be found in all textbooks on mechanics.

If the point makes N complete revolutions per second $s = 2\pi rN$; and the acceleration equals $4\pi^2rN^2$.

3. Simple harmonic motion of translation. This is a vibratory motion, to and fro along a straight line such that, if distances from its middle point are called x, the acceleration of the moving point when it is at a distance x from the centre has the numerical value n^2x, where n is a constant quantity, and its direction is towards the middle point or centre. (To distances at one side of the centre are given positive values; at the other side, negative.) This motion can be easily shown to be identical with that of the point which is the projection on a diameter of a point moving in a circle with uniform speed. It can be shown further that the *period* of this harmonic motion, i.e., the time required for the point to go from one end of its path to the other and back again, is $2\pi/n$, where $\pi = 3.1416$. Half the length of the path is the *amplitude*, and the position of the vibrating point at any instant gives its *phase*. Thus, there may be two vibrating points which have the same period and the same amplitude, but differ in phase—one point lags apparently behind the other.

A pendulum with a long supporting cord makes harmonic vibrations, if the amplitude is small; so does any point of a violin string, if the string is vibrating in its simplest mode; so does a weight hanging from a rubber band or a spiral spring, if it is set vibrating in a vertical direction.

Rotation. It can be shown by geometry that if a figure of any shape with one point fixed is displaced in any way by any series of rotations, the final position may be reached from the initial one by a single rotation around an axis passing through the fixed point. The simplest

mode of describing such a displacement is to imagine a plane section through the figure perpendicular to this axis, to take in this plane a line *fixed in space* and one *fixed in the figure*, and then to measure the rotation by the change in the angle made with the former line by the latter as the figure turns around the axis. Three things are then necessary for the representation of the angular displacement: (1) the *position* of the axis; (2) its *direction*—a line in one direction will represent rotation in the direction of the hands of a watch, while one in the opposite direction will represent opposite rotation; (3) the *numerical value* of the angle of displacement, measured as just described.

(The numerical value of the angle between two lines is obtained by describing a circle of any radius, R, with the point of intersection of the lines as the centre, measuring the length of the arc, A, intercepted between the two lines, and dividing A by R. See TRIGONOMETRY.)

This angular displacement can be completely pictured by a straight line in the proper direction made to coincide with the axis of rotation and of a length proportional to the angle of rotation. Such a line is called a *rotor*, or a *localized vector*, because it is a vector placed in a definite position.

If a rotation around a fixed axis is considered, the *angular speed* is the rate of change of the angle formed by the line fixed in space and that fixed in the figure, as described above. The *angular velocity* in this case is the angular speed around the given axis in a definite sense of rotation; it is therefore a rotor. If a figure with one point fixed is given simultaneously two angular velocities around two different axes, the resultant angular velocity will be a rotor which is the geometrical sum of the two component rotors. *Angular acceleration* is the rate of change of angular velocity, and there are two independent types: (1) the position of the axis fixed, but the angular speed changing; (2) the angular speed constant, but the position of the axis changing. A door or gate when opening or closing is an illustration of the first type; while a spinning top generally furnishes an illustration of the second, because, when the axis of the top is not vertical, it is moving so as to describe a cone in space. Actually in the case of a spinning top the angular speed is decreasing owing to friction, so it is an illustration of the combination of the two types.

The three most interesting cases of rotation are the following:

1. Position of axis fixed, constant angular acceleration. If the constant acceleration is α, and if at any instant the angular speed is ω_0, the angular speed t seconds later will be $\omega = \omega_0 + \alpha t$, and the angle rotated through in that interval of time will be $\theta = \omega_0 t + \frac{1}{2}\alpha t^2$. If t is eliminated from these two equations, it is seen that $\omega^2 - \omega_0^2 = 2\alpha\theta$. This motion is illustrated by a flywheel or grindstone coming to rest under a constant friction or being set in motion at a uniform rate.

It is evident from the above definition of the numerical value of an angle that if the *linear* speed and acceleration of any point at a distance R from the axis are s and a, they are connected with the *angular* speed and acceleration of the whole figure by the relations $s = R\omega$, $a = R\alpha$.

2. Angular speed constant, but the position of the axis describing a cone at a uniform rate. This motion is illustrated, as explained above, by a spinning top. A piece of apparatus which furnishes a more accurate illustration consists essentially of a heavy wheel whose axle is so supported that it can turn freely within a circular ring which is fastened rigidly to a metal rod carrying sliding weights at its further end; this rod is pivoted at its middle point so as to be free to turn in any direction; and the axle of the wheel is set in the same line as this rod. This instrument is called a gyroscopic pendulum. (For a description of one made out of a bicycle wheel, see *Physical Review*, 1901, vol. x, p. 43.) To produce the desired motion, balance the wheel and its ring by means of the sliding weights until the rod is horizontal, set the wheel in rapid rotation, and disturb the balance slightly by adding a small weight to either portion of the rod. The rod will immediately begin to move around in a horizontal plane; and thus the position of the axis of rotation of the wheel will change, and will describe a plane—the limiting form of a cone. The reason for this change is that there is compounded with the angular velocity of the wheel around its own axis another one due to the disturbed balance of the rod which would of itself make the whole apparatus rotate around a horizontal axis, i.e., turn over as the extra weight pulls its side down. This added angular velocity is about an axis at right angles to that of the wheel, and both lie in a horizontal plane; the two angular velocities will compound therefore to form an angular velocity about an axis in the same horizontal plane, but in a position different from that of the axis of the wheel before it was disturbed. As fast as this axis takes up its new position it is again disturbed; and so the motion is a continuous change of position of the axis of the wheel in a horizontal plane. (This case in rotation corresponds, therefore, perfectly to the one in translation of motion of a point in a circle at a uniform speed.) In the actual use of the gyroscopic pendulum there are other phenomena depending upon the properties of matter in motion; the above description is designed to be a purely kinematic one.

3. Simple harmonic motion of rotation. This motion is illustrated by the to-and-fro rotation of an ordinary clock pendulum or by the vibrations of any body set swinging through small arcs when suspended on a horizontal axis, also by the balance wheel of a watch. Let, as before, two lines be taken in a plane at right angles to the axis, one fixed in the figure, the other in space, but so chosen that they coincide when the vibrating figure is in its central position. Then, if θ is the angular displacement at any instant of the line fixed in the figure from the one fixed in space, the angular acceleration equals $m^2\theta$, where m is a constant quantity, and the direction of the axis of the acceleration is such as always to produce an angular velocity towards the position of equilibrium. The period of a complete vibration may be shown to be $2\pi/m$. The amplitude is the extreme angle turned through by the line fixed in the figure; the phase at any given instant depends upon the position of this line at that instant.

Motion in General. Translation and rotation are particular types of motion, and in general the motion of a figure includes both. It may be proved, however, by geometry that the most general displacement of a figure, produced by any number of motions, may be reduced to a combination of a translation along a certain line

and a rotation around it as an axis; such a combination is called screw motion.

DYNAMICS

Kinematics is a science which is concerned with geometrical ideas alone; it is the application of logical principles to certain definitions and axioms; it is not concerned with any appeal to experience. On the other hand, dynamics is fundamentally a science based on our experience of certain sensations associated with the idea of matter; and the object of the science is to make such an analysis of the facts of observation and experience as will lead to the statement of a few principles from which all observed phenomena may be predicted. It is possible to have a science based entirely on definitions—which are suggested by observations, however—and to show that all observed phenomena can be regarded as consequences of these definitions, if they are identified with actual physical quantities which appeal to our senses. Such a science is called theoretical dynamics. In the following treatment statics is considered as a special case of kinetics.

Translation. The simplest property of matter (q.v.) is illustrated by an experiment due to Galileo. If a ball rolls down an inclined plane and then meets another plane inclined in the opposite direction, the ball will roll up it with a constantly decreasing velocity; the less inclined this second plane is, the less is the rate of change of the velocity of the ball as it rolls up; therefore, if the plane is perfectly horizontal, there is every reason for believing that the cause of the observed decreasing velocity of the ball is friction, and that if there were no friction the velocity of the ball would not change. In other words, it is thought to be a general law of nature that a portion of matter free from all external actions will maintain its state of motion unaltered.

If, however, the motion of one portion of matter is influenced by the presence of another piece of matter, it is observed that the effect is mutual. The simplest case of two bodies influencing each other's motion is illustrated by two billiard balls striking when rolling on a *smooth* table, i.e., a surface free from friction; by a man standing on a board which rests on *smooth* ice, and then jumping off; by a bullet fired from a gun; etc. One law applies to all such cases: if m_1 and m_2 are the masses of the two pieces of matter which are supposed to be so small as to be called particles, v_1 and v_2 their linear velocities at any instant, V_1 and V_2 their linear velocities at any later time, then

$$m_1v_1 + m_2v_2 = m_1V_1 + m_2V_2,$$

provided there are no external actions, i.e., provided that the only cause of the change in the linear velocity of one body is connected with the presence of the other. In this equation the sum of m_1v_1 and m_2v_2 and of m_1V_1 and m_2V_2 is a *geometrical* one, for each of the terms is a vector quantity. Owing to the importance of the product mass × linear velocity, it has received a name—*linear momentum*. See IMPACT.

This law can be expressed in a different way. If the positions of two particles of matter of masses m_1 and m_2 at any instant are given by coördinates x_1y_1 and x_2y_2, the coördinates of the centre of inertia (q.v.) are defined to be

$$\bar{x} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2} \text{ and } \bar{y} = \frac{m_1y_1 + m_2y_2}{m_1 + m_2}.$$

Consequently as the particles move the centre of inertia changes its position. If u_1 and u_2 are the components along the axis of X of the velocities of the two particles and w_1 and w_2 their components along the axis of Y, the components along the axes of X and Y of the velocity of the centre of inertia are

$$\bar{u} = \frac{m_1u_1 + m_2u_2}{m_1 + m_2} \text{ and } \bar{w} = \frac{m_1w_1 + m_2w_2}{m_1 + m_2}.$$

But if v_1 and v_2 are the actual velocities of the two particles, v_1 is the geometrical sum of u_1 and w_1. Consequently, if the actual velocity of the centre of inertia is $\bar{v}$, it is the geometrical sum of $\bar{u}$ and $\bar{w}$; i.e.,

$$\bar{v} = \frac{m_1v_1 + m_2v_2}{m_1 + m_2},$$

or $(m_1 + m_2)\ \bar{v} = m_1v_1 + m_2v_2 = m_1V_1 + m_2V_2$. Since $m_1 + m_2$ does not change in any physical action, $\bar{v}$ must remain constant in direction and amount, however the velocities of the two particles are altered by their mutual influence.

So far as is known this law of influence of two bodies can be extended to any number of bodies mutually influencing each other; i.e., if any number of particles of matter of masses m_1, m_2, etc., are left alone, free from external actions, their velocities, however changed by mutual reactions, must satisfy the law that the geometrical sum of the linear momenta remains unchanged,

$$m_1v_1 + m_2v_2 + \ldots = \text{constant}.$$

Expressed in terms of the properties of the centre of inertia of the system of particles, this law is that the centre of inertia of a system of particles free from external influences moves in a straight line with constant speed. A large solid is of course a special case of a system of particles; and the motion of the centre of inertia of such a body must obey the same laws as does a single particle.

This principle of dynamics is known as the conservation of linear momentum. When this principle is applied to the mutual action of two bodies, it takes the form

$$m_1v_1 + m_2v_2 = \text{constant},$$

where m_1 is the mass of one body and v_1 is the velocity of its centre of inertia, m_2 is the mass of the second body and v_2 the velocity of its centre of inertia, and the summation is a geometrical one. This equation means, then, that if m_1v_1 is changed in any way by v_1 changing either in direction or in speed, m_2v_2 must change at the same time by an amount equal and opposite to that of the change of m_1v_1. The rates of changes of the two momenta must then be equal and opposite vectors in the same straight line; i.e., $m_1a_1 = -m_2a_2$ if a_1 and a_2 are the linear accelerations of the two centres of inertia. (Illustrations are afforded by a body falling towards the earth, the earth having an acceleration upward; by a piece of iron attracted to a magnet which is suspended free to move; etc.) This may be expressed by saying that under the influence of the second body the first has received an acceleration a_1. The product m_1a_1 is called the kinetic reaction of the body of mass m_1 against the given influence, which is equal and opposite the kinetic reaction of the second body against the action of the first. The influence of any body on another of mass m is measured, therefore, by the product of m and the acceleration produced, i.e., ma. If there is a system of many bodies, the action on one due to all the others is the sum of its kinetic reactions against

all the actions; i.e., it is the product of the mass of that one into the geometrical sum of the accelerations which each in turn of the others by itself would produce—or the actual acceleration of the one. The product of the mass of any body, therefore, by the linear acceleration of its centre of inertia measures the external influences acting on it. These external influences combine to form what is called the external force. In symbols

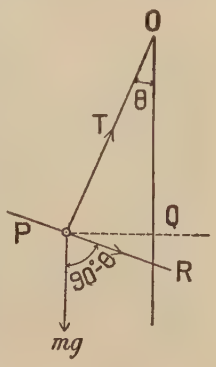
$$F = ma,$$

meaning that if a body of mass m is subjected to a given set of external influences its acceleration is given by F/m, or if bodies of different masses are subject to the same force the accelerations produced vary inversely as the masses. A unit force is such an external action as results in an acceleration of 1 when the mass is 1 or an acceleration 2 when the mass is $\frac{1}{2}$, etc. If the C. G. S. system is used, the unit of mass is a gram, and a unit acceleration is a change in one second of the velocity by an amount of one centimeter per second; the unit force on this system is called the dyne. The dyne is so small, being illustrated nearly by the upward force of the hand required to keep a milligram from falling, that a megadyne (or $10^6 \times$ dyne) is used as a practical unit.

There are many kinds of forces (see FORCE)—gravitation, electrical, magnetic, muscular, elastic, etc. It should not be thought that they are *things* that exist; they are simply numerical values of quantities giving the measure of external influences on the motion of a body, e.g., the effect of pulling a string attached to a body, the effect of a magnet on a piece of iron, etc. Forces are vector quantities and may be compounded or resolved into components. The commonest illustrations of a force are given by a body falling freely towards the earth, in which case the acceleration, g, is a constant for all bodies at any one place on the earth's surface (see GRAVITATION), and so the force on a body of mass m is mg, and if a body is suspended and kept from falling there must be an upward force mg due to the suspension; g is nearly 980 centimeters per second per second, or about 32 feet per second per second. This product mg is called the weight of the body.

One of the most important illustrations of force is shown by uniform motion of a particle in a circle, which may be produced by a string whirling the body in a sling, or by making the body roll around inside a horizontal circular hoop on a smooth table. In the former case the string is said to exert a tension on the particle; in the latter, the hoop is said to exert a pressure on it. In both cases the acceleration is s^2/r, where s is the linear speed of the particle and r is the radius of its path and has the direction from the moving particle towards the centre of the circle; consequently the force is ms^2/r in this direction. In other words, to make a particle of mass m move at a uniform speed s in a circle of radius r requires a force acting on it directed towards the centre and with a numerical value ms^2/r, or, if ω is the angular speed of the particle, $mr\omega^2$. If this force is decreased, the particle will cease to move in a circle and will move farther away from the centre; if the force is removed at any instant—by cutting the string—the particle will continue to move with the same velocity that it has at that instant, i.e., along the tangent to the circle with a constant speed. This fact that, unless the force is sufficiently great, the particles of a rotating body will move farther away from the axis of rotation is illustrated in many ways. The body is said to move under the action of a centrifugal force.

A simple pendulum is defined to be a particle of matter suspended by a long massless string. If it swings through small angles in a vertical plane, the motion of the particle, or bob, is practically in a straight line, and is simple harmonic. Let O be the point of suspension of the pendulum, let OQ be its position when hanging at rest, and OP its position at any instant while it vibrates; call the angle QOP, θ. There are two forces acting on the particle of mass m placed at P: one is the tension of the string along the string towards O, the other is its weight mg, vertically down. The actual motion at this instant is tangent to the circle whose radius is OP, i.e., it is in the direction PR, either up or down. The force T has no component in this direction, being perpendicular to it; and that of the force mg is $mg\sin\theta$ (using the general formula for resolving a vector). Therefore the acceleration of the vibrating particle, in the direction PR, the force divided by the mass, is



$$\frac{mg\sin\theta}{m} \text{ or } g\sin\theta.$$

This acceleration may be written

$$g\frac{PQ}{OP}; \text{ or calling } PQ,\ x, \text{ and } OP,\ l,\ g\frac{x}{l}.$$

If the amplitude is very small, PQ is practically the path of the moving particle; and thus the motion is harmonic, in accordance with the definition of such motion; and its period, therefore, is

$$2\pi\sqrt{\frac{l}{g}}.$$

For other illustrations of forces, see ELECTRICITY; MAGNETISM; ELASTICITY; GRAVITATION; CENTRAL FORCES.

It has been shown that, if there are no external influences, the centre of inertia of a system of particles or of a large body continues, if in motion, to move in a straight line with a constant speed. This is owing to the fact that the action and reaction of each pair of particles are equal and opposite. If, however, there are external forces, the acceleration of the centre of inertia in any direction is the sum of the components of these forces in this direction divided by the mass of the whole system. This is equivalent to saying that the motion of the centre of inertia of a system of particles is exactly as if a single particle of the mass of the system were under the influence of the given forces. Thus, if an iron beam falls from a building (without touching anything as it falls), the motion of its centre of inertia is like that of a falling particle—vertical—however the beam revolves. If a hammer is thrown at random into the air, its centre of inertia will describe a parabola, because that is the path of a projected particle. See PROJECTILE.

Many forces are not constant and some are abrupt, like the blow of a hammer; and in these cases it is impossible to measure them. Their *effect* is evidently to produce a sudden change in velocity; and it is measured by the *total* change in the linear momentum. Force itself is the rate of change of linear momentum; so if a force F acting on a particle produces a change of momentum from mv_0 to mv in an interval of time t,

$$F = \frac{mv - mv_0}{t},$$

and thus the total change of momentum equals the product of the force and the interval of time. This product Ft is called the impulse of the force, and may be measured even if both F and t are unknown. Similarly, if an impulsive force acts on a large body, the velocity of its centre of inertia will be changed from v_0 to v in the *direction* of the force. In other words, the change of velocity of the centre of inertia, $v - v_0$, equals the amount of the impulse divided by the mass of the body, entirely regardless of the *point* of application of the force. The *time* required for a force F to change the velocity from v_0 to v is

$$\frac{mv - mv_0}{F}.$$

The *distance* required for this same force F to produce this change in velocity from v_0 to v in its direction is found by the formulæ of kinematics, which show that under a constant acceleration a the distance traversed while the speed changes from s_0 to s is such that $2ax = s^2 - s_0^2$. Therefore, in this case, since $a = F/m$,

$$x = \frac{\frac{1}{2}ms^2 - \frac{1}{2}ms_0^2}{F}.$$

The product Fx, i.e., the force multiplied by a distance in its line of action, is called the work; the quantity $\frac{1}{2}ms^2$ is called the kinetic energy of translation of the body whose mass is m when it has the speed s. This formula is expressed in words by saying that the *work done by the force* on the body equals the *increase* in its kinetic energy of translation, provided the speed is increasing, e.g., a train being set in motion. If the speed is decreasing, e.g., a train slowing up by virtue of its brakes and the resulting friction, it is said that the body *loses* an amount of kinetic energy of translation equal to the work it does in overcoming friction or *against the force F*.

Rotation. A rigid body is defined as one which is not deformed in any way under the forces acting on it. If such a body is pivoted on an axis whose position is fixed, e.g., a door, a grindstone, etc., it is self-evident that the angular motion produced in it by a force such as a push or pull depends not alone on the amount of the force and its direction but also on its point of application. Thus, if the force is at right angles to the door and near the hinges, there is only a slight effect; if it is applied near the edge of the door, it is much greater; and if the line of action of the force passes through the axis of rotation, there is no effect so far as rotation is concerned. If a plane section be imagined in the body, at right angles to the axis, it is evident that a force perpendicular to this plane, i.e., parallel to the axis, has no effect on the angular motion; while a force lying in this plane has an effect which depends upon both the force and the perpendicular distance from the point where the axis cuts the plane to the line of action of the force. This perpendicular distance is called the lever arm of the force with reference to the axis; and the product of the numerical value of the force and its lever arm is called the moment of the force around the axis. A moment such that the resulting effect of the force is to produce rotation in one direction is called positive; while if its effect is to produce the opposite rotation it is called negative. A moment is, then, a rotor. It can be shown that the moment of a force about an axis is the proper numerical value to give the rotational effect of the force; for, if a body pivoted on an axis is kept from turning under the opposing actions of two forces differently placed, it is found that the moments of the two forces about the axis are equal and opposite.

If a moment is acting on a pivoted body such as a door, its immediate effect is to produce angular acceleration; just as the effect of a force in translation is to produce linear acceleration. It is important to determine the connection between the moment of the force and the resulting angular acceleration. The simplest case is that of a particle of matter joined to an axis by a massless rigid rod, and a force acting on the particle at right angles to the rod. If the rod has a length r and the particle has a mass m, the moment of the force F around the axis is Fr, and the *linear* acceleration of the particle in the direction of the force is $\frac{F}{m}$. Therefore the *angular* acceleration (α) is $\frac{F}{mr}$; and if the moment of the force is called L,

$$L = Fr = mr^2\alpha.$$

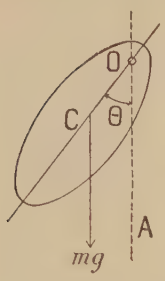
The coefficient of α, mr^2, is called the moment of inertia of the particle around the axis. If, now, the rotating body is of any shape or size, it may be shown that the angular acceleration (α) resulting from a moment (L) is given by the formula $\alpha = \frac{L}{\Sigma mr^2}$, where Σmr^2 is the sum of the products of the mass of each particle of the body by the square of its distance from the axis. Σmr^2 is called the moment of inertia of the whole body around the axis and is commonly written I. Hence

$$L = I\alpha,$$

a formula for rotation of a rigid body around an axis whose position is fixed, which corresponds perfectly with the formula $F = ma$ for translation. In the same way, therefore, that m measures the inertia of a body so far as translation is concerned, I measures its inertia for rotation.

A simple illustration is that of a body pivoted about a horizontal axis so that it can make oscillations under the action of gravity, like a common clock's pendulum. Take a plane section of the body at right angles to the axis of rotation (at O) and passing through the centre of inertia (C), to describe the rotation choose the line fixed in the body as the one joining the centre of inertia of the body and the point where the axis meets the plane (OC), and as the line fixed in space the one where OC comes when the body is hanging at rest (OA). As the body vibrates, it will occupy in turn different positions which are completely described by the angle

(θ) between OC and OA. The problem is to find the angular acceleration. There are two forces acting on the body: one is the supporting force at the pivot, and its moment about the axis is zero because it passes through O; the other is the weight of the body, which is mg, where m is the mass of the body and g is the linear acceleration of a body falling freely, and its line of action is vertically down through the centre of inertia—both of which facts will be explained later. Calling the length of the line OC, l, the moment of the force mg about the axis through O is $mgl\sin\theta$; therefore the angular acceleration is $\frac{mgl\sin\theta}{I}$, and it is in such a direction around the axis as to produce angular motion tending to bring OC to coincide with OA. If the amplitude of the vibration is small the $\sin\theta$ may be replaced by θ; and the angular acceleration is $\frac{mgl}{I}\theta$. Consequently the motion is simple harmonic, and the period of one complete vibration is $2\pi\sqrt{\frac{I}{mgl}}$. Such an oscillating body is called a compound pendulum, and it has many interesting properties. (See CENTRE OF GYRATION; CENTRE OF OSCILLATION.) A simple pendulum is a special case of a compound one; in it $I = ml^2$ and so the period becomes, as before, $2\pi\sqrt{\frac{l}{g}}$.



Since $L = I\alpha$, if the angular velocity around the axis is called ω, this equation may be written

$$L = \frac{I\omega - I\omega_0}{t},$$

where $\omega - \omega_0$ is the change in the angular velocity in t seconds. The product Lt is called the impulse of the moment of the force, or the moment of the impulse of the force. As a result of an impulsive moment, the product $I\omega$—called the angular momentum—is changed.

The time taken for a moment L to change the angular velocity from ω_0 to ω is evidently

$$t = \frac{I\omega - I\omega_0}{L}.$$

The angle through which the body turns while this change is going on is given by the formula of kinematics $2\alpha\theta = \omega^2 - \omega_0^2$; and as $\alpha = L/I$, the angle

$$\theta = \frac{\frac{1}{2}I\omega^2 - \frac{1}{2}I\omega_0^2}{L}$$

or

$$L\theta = \tfrac{1}{2}I\omega^2 - \tfrac{1}{2}I\omega_0^2.$$

The product $L\theta$ is called work; and the work is said to be *done by* the moment if ω is increasing, and *against* the moment if ω is decreasing. $\frac{1}{2}I\omega^2$ is called the kinetic energy of rotation of the body whose moment of inertia about a given axis is I and whose angular speed is ω. (One should note that these values of work and kinetic energy can be derived from the corresponding values for translation if the rotating body is considered made up of particles each of which therefore has motion of translation.)

Motion in General. If the rigid body is not pivoted around a fixed axis but is free to move in any direction or manner, it will receive, in general, both linear and angular acceleration under the influence of a force, e.g., if a body is thrown in the air. (Under the action of gravity alone there is, however, only linear acceleration, for reasons to be given immediately.) It has been shown that the linear acceleration of the centre of inertia of a body acted on by any forces is the same as that which a particle having a mass equal to that of the body would have under the action of the same forces. A force in general does not have a line of action passing through the centre of inertia; imagine a plane section of the body through the line of action and the centre of inertia; the force will then in general have a moment about an axis through the centre of inertia perpendicular to this plane. Since the translation of the centre of inertia of the body under the action of the force is quite independent of the rotation, the rotation will be exactly as if the above axis is fixed; i.e., if m is the total mass of the body, I its moment of inertia about this particular axis, F the force, and L its moment about the axis, the linear acceleration of the centre of inertia will be $\frac{F}{m}$ and the angular acceleration $\frac{L}{I}$. So, if the force has its line of action through the centre of inertia, there will be no angular acceleration, e.g., the action of gravity upon a falling body.

If an impulsive force, whose impulse is K and whose lever arm with reference to an axis through the centre of inertia is k, acts upon the body, the velocity of the centre of inertia in the direction of the force will change according to the formula $v - v_0 = K/m$, and the angular velocity about the axis through the centre of inertia will be given by the formula $\omega - \omega_0 = \frac{Kk}{I}$. If the body is originally at rest, its centre of inertia will move in the direction of the force with a velocity K/m, and it will rotate with an angular velocity $\frac{Kk}{I}$. If the line of the force is through the centre of inertia, $k = 0$ and there is no angular motion. This fact furnishes an experimental method for the determination of the centre of inertia (q.v.).

If the linear velocity of the centre of inertia at any instant is v, and if the angular velocity is ω, the entire kinetic energy is $\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$, where m is the total mass and I is the moment of inertia of the body about the axis of rotation through the centre of inertia.

All applications of mechanics to astronomy, etc., are based upon this fundamental equation of Newton, force = mass × acceleration. If in the future it is proved that matter owes its distinctive properties to its contained electric charges, it will be possible to deduce the laws for mechanics from the laws for electricity; but these laws must certainly agree, within the limits of experimental accuracy, with the Laws of Newton.

Composition of Forces—Statics. If several forces are acting on a rigid body there will be produced as a rule both linear and angular accelerations; it is a problem then to determine what single force, if any, can produce the same result. If such can be found, it is called the resultant. Since, as stated in kinematics, the most general motion is a screw motion, it is impossible in general to have a resultant. If,

however, the forces all have their lines of action in one plane, they have a resultant except in one case to be noted hereafter. Such forces are called coplanar. It is simplest to distinguish between two groups of pairs of forces, parallel and nonparallel.

Two Nonparallel Coplanar Forces. The lines of action of two such forces meet in a point in their plane. Consider a case in which this point is in the rigid body on which the two forces are acting. The effect of a force upon a rigid body is evidently the same wherever its *point* of application is, provided it is in the line of action of the force. Therefore the action of the two forces in this case is as if they were both applied at that point of the rigid body where their lines of action cross. Their resultant is then found by constructing their geometrical sum at this point; for such a force has obviously a translational effect equivalent to the sum of the effects of the two forces, and it may be shown by simple geometry that its moment around any axis is equal to the sum of the moments of the two forces around that axis, and so its rotational effect is the same as the combined effects of the two forces. The line of action of the resultant passes through the point of intersection of the two forces, but its *point* of application can be anywhere in this line; consequently it is entirely immaterial whether the point of intersection itself is a point of the body or not.

Since the process of determining the geometrical sum of two forces consists in forming the parallelogram with these forces as adjacent sides and drawing the diagonal, this principle of the composition of two nonparallel coplanar forces is sometimes called the parallelogram of forces.

It is evident that if the body is under the action of three forces, one of which is equal and opposite to the resultant of the other two, there is no resulting force or moment; i.e., there is neither linear nor angular acceleration. Such a condition is called equilibrium (q.v.). The stability, instability, etc., of equilibrium are discussed in the article on EQUILIBRIUM.

Conversely, if a rigid body is in equilibrium under the action of three nonparallel forces, their lines of action must meet in a point, they must lie in one plane, and one must be equal and opposite to the geometrical sum of the other two. It is obvious that, if these conditions are satisfied, the three forces will, when drawn as lines, form a closed triangle. For this reason this principle is sometimes referred to as the triangle of forces.

Two Parallel Forces. Two parallel forces form a limiting case of two nonparallel coplanar forces whose point of intersection recedes to an infinite distance. Their geometrical sum then becomes their *algebraic* sum; if the two forces are in the same direction, their resultant is a force parallel to them, in the same plane, and numerically equal to the sum of their numerical values; if they are in opposite directions, their resultant is a force parallel to them, in the same plane, and numerically equal to the difference of their numerical values. (For the time being the case is excluded in which the two parallel forces are equal and opposite; such a combination is called a couple, q.v.) This resultant must have such a position relative to the two forces that its moment about any axis equals the sum of their moments about the same axis. If the forces are as shown in the figure, F_1 and F_2 being at a known distance $\overline{AC}$ apart and O being the intersection of any axis perpendicular to their plane with the plane, $OCBA$ being a line perpendicular to the forces, the resultant R must have such a position that

$$R\overline{BO} = F_1\overline{AO} + F_2\overline{CO}.$$

Substituting for R its value $F_1 + F_2$, this becomes

$$(F_1 + F_2)\,\overline{BO} = F_1\overline{AO} + F_2\overline{CO},$$

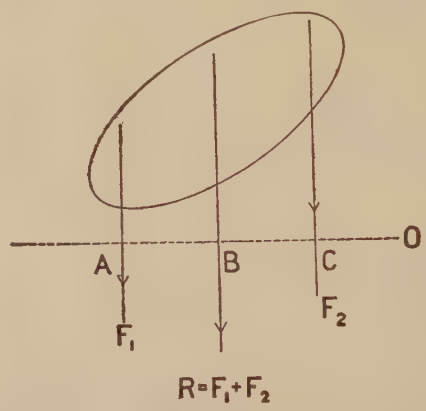
or

$$F_1\overline{AC} = (F_1 + F_2)\,\overline{BC};$$

hence

$$\overline{BC} = \frac{F_1}{F_1 + F_2}\overline{AC},$$

and therefore the position of the resultant is given in terms of known quantities. (This expresses the obvious fact that the moment of the resultant around an axis through C equals the moment of F_1 around the same axis; for the moment of F_2 around this axis is zero.) In a perfectly similar manner the resultant of two parallel forces in opposite directions may be found.



One of the most important illustrations of parallel forces is given by the gravitational action of the earth on a body. Experiments show that the accelerations of all bodies—all materials and all quantities—when falling freely towards the earth at any point on its surface are the same, g. Therefore each particle of matter of mass m near the surface of the earth is being acted upon by a force mg, whose direction is towards the centre of the earth. Any large rigid body is, then, under the action of a great number of parallel forces. Their resultant is a vertical force Mg, if M is the total mass of the body. Its centre, i.e., the point through which its line of action always passes, however the body is turned, is called its centre of gravity (q.v.). It may be shown analytically and by experiment that this point coincides with the centre of inertia of the body. This is further evident from the fact that, if a body falls, however it revolves in so doing, its centre of gravity must have the acceleration g; and this property has been shown to be peculiar to the centre of inertia.

It is evident that if a rigid body is under the action of three coplanar parallel forces, one of which is equal and opposite to the resultant of the other two, the body is in equilibrium. The conditions then are (1) that the algebraic sum of the three forces equals zero; (2) that the algebraic sum of the moments of the three forces around any axis equals zero. If any number of coplanar forces, parallel or nonparallel, act on a rigid body, their resultant may be found by compounding them in pairs, as described. If, however, the final pair of forces is a couple, i.e., consists of two equal and opposite forces, there is no resultant. The moment of a couple around any axis perpendicular to their plane is the product of either of the forces by their distance apart; this product is called the strength of the couple. The action of a couple is to make a body rotate about an axis perpendicular to its plane and passing through the centre of inertia of the body; and this can be balanced, not by a single force, but by another couple of equal strength and opposite in direction. A couple is, then, a rotor.

The action on a rigid body of any number of forces in all directions can be reduced in the end to a single force through the centre of inertia and a couple; for each force can be replaced by a parallel force through the centre of inertia and a couple lying in its plane, and so all the forces reduce to the sum of a number of forces all passing through the centre of inertia and to the sum of an equal number of couples each tending to produce rotation around its own axis passing through the centre of inertia.

The dynamics of fluid bodies are considered in HYDRODYNAMICS and PNEUMATICS.

Work and Energy. Two general formulæ were developed in the discussion of translation and rotation,

$$Fx = \tfrac{1}{2}ms^2 - \tfrac{1}{2}ms_0^2,$$
$$L\theta = \tfrac{1}{2}I\omega^2 - \tfrac{1}{2}\omega_0^2.$$

The first formula may be expressed in words as follows: if a particle whose mass is m is moving with a speed s_0 in any direction, this will be changed to s in that same direction under the action of a constant force F in that direction, provided the distance traversed in that time is x as given by the relation $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$. An illustration is afforded by an arrow shot from a bow: $s_0 = 0$, then $Fx = \frac{1}{2}ms$. Fx is called the work done by the bow, and the quantity $\frac{1}{2}ms^2$ is called the *kinetic energy of translation.* Any body, not itself in motion, which has the power of producing kinetic energy in another body is said to have *potential energy.* Thus, a bent bow, a compressed spring, a stretched elastic cord, etc., have potential energy. To bend the bow, compress the spring, stretch the cord, etc., a force must be overcome; i.e., motion is produced in a direction contrary to the elastic force of the body. The numerical value of the potential energy is defined as equal to the product of the force overcome and the distance through which this has been done, i.e., to the work done on the bow, spring, or string. If the spring is compressed by a body falling upon it, the spring gains potential energy, since work is done on it and the body loses kinetic energy. (The spring and body together would naturally continue to vibrate up and down, but it may be supposed here that the spring is caught and held when it is compressed to its greatest extent.) If F is the force of opposition due to the spring and x the distance required to change the speed of the body of mass m from s to s_0, the gain of potential energy of the spring in that distance is Fx and the loss of kinetic energy is $\frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$, where $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$. Similarly, if the spring expels the body, the spring does work on the body and loses potential energy and the body gains kinetic energy, the loss in potential energy being Fx and the gain in kinetic energy being $\frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$ if in the distance x the speed is increased from s_0 to s; and as before, $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$. The kinetic energy of the spring itself is neglected.

In words, this formula means that the loss of potential energy of the system producing the acceleration equals the gain of kinetic energy of the particle accelerated; or, the gain of potential energy of a system producing retardation equals the loss of kinetic energy of the retarded particle. Kinetic energy may also be produced by the impact of another body; and all experiments are in accord with the idea that the kinetic energy gained by a body in this case equals that lost by the impinging particle *provided no other effects are produced.* This is illustrated by the impact of perfectly elastic bodies. (In general, when there is impact, heat effects, such as rise of temperature, are produced, in which case the kinetic energy gained by the particle does not equal that lost.) In general, then, in mechanics, whenever one body loses energy another body gains an equal amount, work being simply the transfer of the energy. Work is done in two ways—producing a change in speed and overcoming some opposing elastic force. Unless there is *motion* in the direction of the force no work is done.

It is evident that the kinetic energy of a moving body involves the idea of *speed,* not *velocity,* because the amount of work it can do is independent of the *direction* of the motion. (Also, if there is no change in the speed of a body, the force is at right angles to the motion, and so no work is done, whatever the change in direction may be.) Illustrations of the second formula, $L\theta = \frac{1}{2}I\omega^2 - \frac{1}{2}I\omega_0^2$, are given by the turning of a grindstone and by a flywheel being set in motion or stopped.

There are other ways of doing work than in overcoming elastic forces and producing speed, e.g., raising a body up from the earth, separating a piece of iron from a magnet, separating two bodies electrified oppositely, overcoming the force of friction, etc. In all these cases the body doing the work loses energy and the system on which work is done gains energy. The principle of the conservation of energy is that in every case the energy lost by the former equals that gained by the latter; so that on the whole there is no change. Every phenomenon in nature is in accord with this principle so far as is known.

When a body is raised from the earth work is done equal to the product of the weight of the body and the *vertical* height it is raised, mgh. This amount of energy is gained by the system consisting of the earth and the body whose mass is m; but until gravitation is understood it will be impossible to locate the energy in any definite place or places. If a body falls through a height h, it and the earth lose potential energy, mgh, which is gained in the form of kinetic energy by the falling body and the earth, principally by the former, since the change in the speed of the earth occasioned by the body as it falls towards

it is so infinitesimal. If, after the body falls a distance h, its speed is s, its kinetic energy is $\frac{1}{2}ms^2$, and therefore $mgh = \frac{1}{2}ms^2$, or $s^2 = 2gh$. This formula shows that the speed of a falling body depends upon the *vertical* height traversed, not on the slope or length of the path itself; it may fall vertically, or down an inclined plane, or down a spiral, etc.

The cases of work being done against electrical and magnetic forces are discussed under ELECTRICITY and MAGNETISM. Whenever work is done in overcoming friction it is observed that heat effects are produced, which can be traced to the fact that the minute portions of the body on which the work is done gain energy. This question is fully discussed under HEAT. Since, when any inelastic body is deformed in any way, there is internal friction, part of the energy gained by such a body when it strikes another body goes into producing heat effects.

It is a general property of motion, which follows at once from the definition of potential energy, that all motions take place of themselves in such a manner as to make the potential energy of the system decrease, and that equilibrium is not reached until the potential energy has reached a value such that it is a minimum—i.e., is as small as is possible under existing conditions.

The unit of work or energy is that corresponding to a unit force acting through a distance of a unit length. On the C. G. S. system this unit is, then, that corresponding to a force of one dyne acting through one centimeter; it is called an erg. An erg is, however, such a small unit that 10^7 ergs—a joule, as it is called—is ordinarily used as the practical unit. The amount of work done in a unit interval of time by any agency is called its activity or power (q.v.). On the C. G. S. system the unit is, then, one erg per second. The practical unit is, however, one joule per second; this is called a watt.

Machines are mechanical appliances by means of which a force applied at one point and in a definite direction is made to produce a different force at another point and generally in a different direction; the work done by means of the latter force can never be greater than that done by the former—it is in practice always less, owing to friction and other causes. The mechanical advantage of the machine is the ratio of the two forces described above. There are many forms of machines—levers, pulleys, inclined plane, wedge, screw, windlass, etc. (See the separate articles.) The problem in any one case is to determine the theoretical mechanical advantage of a machine; i.e., on the assumption that there is no friction when the forces are working. There are two general methods of solving this: one is to imagine a certain force acting on the machine and to determine by the ordinary principles of equilibrium what second force will just balance the action of the first; the second is to consider the machine in equilibrium under the action of these two forces, then to imagine a small displacement, and to express the fact that the work done by one force equals that done against the other. For the application of these principles to the various machines reference should be made to the separate articles in which they are described.

Bibliography. A brief useful treatise for the general reader, which gives a clear conception of the elementary principles of mechanics, is J. C. Maxwell, *Matter and Motion* (New York, 1892). The following works, all of which are standard, can be recommended to the student of mechanics: Routh, *Elementary Rigid Dynamics* (London, 1891); id., *Advanced Rigid Dynamics* (ib., 1892); id., *Statics* (2 vols., Cambridge, 1892); E. Mach, *Science of Mechanics* (Eng. trans., Chicago, 1893); Love, *Theoretical Mechanics* (Cambridge, 1897); Routh, *Dynamics of a Particle* (ib., 1898); Ziwet, *Theoretical Mechanics* (New York, 1904); John Cox, *Mechanics* (ib., 1904); Goodman, *Mechanics Applied to Engineering* (London, 1904); Barton, *Mechanical Processes* (Annapolis, 1906); W. B. Anderson, *Physics for Technical Students: Mechanics and Heat* (New York, 1914); E. R. Maurer, *Technical Mechanics* (3d ed., ib., 1914); also the invaluable *International Catalogue of Scientific Literature: Mechanics* (London, 1902 and annually).

MECHANICSBURG, mĕ-kăn'ĭks-bûrg. A borough in Cumberland Co., Pa., 8 miles west of Harrisburg, on the Cumberland Valley Railroad (Map: Pennsylvania, H 7). It is the seat of Irving Female College (Lutheran) and has a public library. The city is surrounded by a rich agricultural country and has extensive drop-forging works, knitting mills, wheel works, foundry and machine shops, and a spoke factory. The government is vested in a burgess and a council. Mechanicsburg was settled in 1806 and was incorporated as a borough in 1828. It was the most northern point at which the Confederates established headquarters during the Civil War. Colonel Jenkins was in command of a regiment of cavalry quartered here June 28–30, 1863. Pop., 1900, 3841; 1910, 4469.

MECHANICS INSTITUTE. An institution founded in 1891 by a consolidation of the Rochester (N. Y.) Athenæum, incorporated in 1830, and the Mechanics Institute of Rochester, founded in 1885. The institute aims to furnish thorough and efficient training to those who may be engaged in industrial or domestic pursuits which will fit them for positions of trust or as instructors in the same lines of work. It is a technical school and, while it confers no degrees, it grants diplomas and certificates for the satisfactory completion of the various courses of instruction. There are four departments—industrial arts, household arts, applied and fine arts, and academic. The institute occupies a block within two squares of the centre of the city of Rochester. The most important buildings are the Eastman Building, containing laboratories; the Bevier Memorial Building, containing classrooms and an exhibition room; mechanical shops; and a power plant. The regular courses are for nine months. The coöperative industrial and coöperative engineering departments have a twelvemonth's session. There are also evening sessions in practically all departments of instruction and a summer-school session. The total attendance in all departments of the institute in 1913–14 was 522, and the faculty numbered 94. There is an endowment fund of about $112,000 and an annual current expense fund of about $120,000, as well as scholarship and students' loan funds. There is a technical reference library of 3500 volumes, and the institute is within two blocks of the Reynolds Library, containing 72,000 volumes. The president in 1915 was Carleton B. Gibson, A.M., LL.D.

MECHANIC'S LIEN. A statutory lien or charge upon real estate to secure payment for work and labor performed on, or materials fur-

nished for, buildings or other improvements thereon at the request or with the consent, express or implied, of the owner. Under the early English law no liens on real estate were recognized, as it was against the policy of the feudal system to permit a tenant thus to charge land which he held of his feudal lord, who in turn held of the King. After the feudal system was abolished lands might be charged with liens by express agreement of the owner, and this became common in the form of mortgages. Courts of equity also recognized certain agreements and transactions as having the force of mortgage liens. Strictly speaking, therefore, there are no common-law liens on real estate. By statute, however, several such liens were created, such as judgment liens and liens for taxes and assessments.

With the development of business customs much work which was formerly done by persons acting as servants for a master came to be performed by independent contractors. For the protection of such contractors and of materialmen whose wares are used in buildings and other improvements on real estate, the statutes known as mechanic's lien laws have been enacted in all the United States and in Canada, but not in England. There was a precedent by analogy for such laws in the common-law liens of artisans on personal property for labor bestowed on it, such as the repair of a wagon or a pair of shoes. Somewhat similar liens on real estate were also recognized and protected by the civil law. The theory on which mechanics' liens are given by statute is that the value of the real estate has been increased by the addition of the improvements on which the work was performed or materials furnished, and that the property so improved may fairly be subjected to such claims. This creates a preference of these claims over those of unsecured creditors of the owner, but a mechanic's lien is subject to valid prior liens on the real estate, such as mortgages, judgments, taxes, etc.

The term "mechanic's lien" is used in a general sense to cover all liens for labor, whether skilled or unskilled, as well as for materials furnished in the construction or repair of buildings. These liens give a right to look to the property for compensation, but, unless the work was directly ordered by him, do not create a personal claim against the owner. As a general rule, the lien attaches both to the building or improvement and to the land on which it is erected; but if the improvement is placed on the land without the owner's consent the lien will not extend to the land, but may nevertheless cover the improvement to the extent of the interest of the person, as the tenant or contractor, who ordered the work and materials. The lien attaches only to the very property on which the work was done, and will not affect the other real estate of the owner. A mechanic's lien may be filed against any title or interest in real estate, even though it is quite limited, as a lease for a year, provided it is such an interest as may be sold on execution.

The statutes in the different States vary in their provisions as to the character of the improvements which will serve to raise a lien. In general, however, such liens will attach to the real estate where any structure in the nature of a building is constructed, altered, or repaired. In some States the right is extended to cover the erection of fences, laying pipes, building sewers, grading, terracing, or sodding the land, and all other improvements which may be said to benefit the land. The idea of benefit is usually consistently followed, in that the lien does not attach where buildings are torn down or moved from the land. In most States only a person who does work or furnishes materials at the request of the owner or his authorized agent, as a general contractor, is entitled to protect himself by a mechanic's lien. However, in a number of States, subcontractors, i.e., those who work or furnish materials for the one who contracts directly with the owner, are allowed to file direct or subordinate liens against the property.

As a general rule the work to which the owner is entitled under a contract must be entirely performed before the contractor can file a lien, but where an owner defaults in his payments or otherwise breaks his part of the contract, the right to file a lien usually attaches at once. In order to perfect a mechanic's lien the statutes of most jurisdictions provide that a notice setting forth the names of the owner and the party claiming the lien, the character of the work done, a description of the premises, the total contract price, the amount paid thereon, the amount still due, and the date when the last item of work was performed, shall be filed in the county clerk's office and a copy thereof served on the owner of the property affected. In a number of the States this lien attaches and relates back to the time of the commencement of the work upon its being filed, and is prior to all liens for work done subsequent to that time; but this is not the general rule, as liens usually attach and take precedence according to the order of their being filed. The statutes of the States vary in their details as to procedure, time of filing, etc., and must be consulted to ascertain those particulars. See GARNISHMENT; LIEN; MORTGAGE.

MECHANICS OF DEVELOPMENT. This term, or Entwicklungsmechanik of the German embryologists and cytologists, is in frequent use, suggested by the changes undergone during cell division (see MITOSIS) and also in the egg of all animals previous to and following fertilization. These changes are so orderly and complex as to suggest mechanical causes for them. As early as the first quarter of the last century Pander (1817) inquired into the mechanics of development, and Lotze followed him with some luminous suggestions. The subject was continued by His and by Rauber, Van Beneden, and more recently through observation and experiments in artificial fertilization and in animal grafting carried on by O. Hertwig, Boveri, Fol, Bütschli, Pflüger, Born, Roux, Driesch, Schultze, Gerlach, Wilson, Loew, and others. Thus, Bütschli by his researches on foam has shown that the forms of the amœba and other Protozoa may be due to mechanical causes of the environment. His studies may be called protoplasmic mechanics. Here also come in the suggestions of Herbert Spencer and of Ryder as to the mechanics and mathematics of the initial steps taken during the growth of organisms. See GROWTH.

MECHANICSVILLE, mē-kăn'ĭks-vĭl. A village in Saratoga Co., N. Y., 19 miles north of Albany, on the Hudson River and the Champlain Canal and on the Delaware and Hudson Company and the Boston and Maine railroads (Map: New York, G 5). It has a public-school library and fine municipal and high-school buildings. The

industrial interests are favored by abundant water power and include extensive manufactures of pulp and paper, knit goods, sash and blinds, shirts and collars, metal goods, brick, iron beds, and mattresses. The water works are owned and operated by the municipality, which has adopted the commission form of government. Pop., 1900, 4695; 1910, 6634.

MECHANICSVILLE, Battle of. A battle fought at Mechanicsville, on the Chickahominy River, 7 miles from Richmond, Va., June 26, 1862, between a Federal force of about 5000 under the immediate command of General Fitz John Porter and a Confederate force of about 10,000. The Confederates, under A. P. Hill, made a fierce and reckless attack on the strong Federal position, but, after suffering great loss, were finally driven back. Early on the morning of the 27th, however, General Jackson with a strong Confederate reënforcement having arrived in the vicinity, General Porter abandoned his position for a stronger one several miles to his rear, where later in the day he was again attacked. (See Gaines's Mill.) In the engagement at Mechanicsville the Federals lost about 360, the Confederates about 2000. The engagement was the first of the so-called Seven Days' Battle of the Peninsular campaign, and is sometimes known as the battle of Beaver Dam Creek. Consult: Ropes, *The Story of the Civil War*, part ii (New York, 1907); Alexander, *Military Memoirs of a Confederate* (New York, 1907); Steele, *American Campaigns* (Washington, 1909).

MECHANISM, mĕk′*a*-nĭz′m (Lat. *mechanisma*, contrivance, from Gk. *μηχανή, mēchanē*, device). In philosophy often this term is employed to designate any view which seeks to explain the universe in terms of the machinery of its processes, and, as this machinery is understood only in its movement, mechanism is frequently restricted to designate the view that the universe is a vast system of motions. In this sense mechanism is practically equivalent to materialism (q.v.). It is, however, often used as a synonym for naturalism (q.v.); in this latter sense its usual antonym is teleology (q.v.). The modern physical sciences have been elaborated on a mechanistic basis in the sense that the fundamental formulas of physical science are kinematic and kinetic formulas. Now the question arises whether in biology and in psychology these same formulas hold good: they may not be alone in being applicable to biological and psychological facts, being counteracted by vitalistic and conscious forces. The mechanist maintains that they and they alone are applicable everywhere and that there are no nonmechanistic forces, such as vitalism, opposed to mechanism. Such a contention is unobjectionable, provided "mechanism" be held as an elastic conception and not exclusively identified with the methods of behavior of matter in its inorganic forms. If mechanism be rigidly confined to denote the laws of inorganic matter, then it is sheer dogmatism to insist that these are the only laws of matter. One of the most satisfactory discussions of this subject is given by Prof. H. S. Jennings. "Does not the knowledge of the properties of matter given by physics and chemistry show that the phenomena of life cannot be considered manifestations of the properties of matter? This question is based on the abandonment of the radically experimental point of view. What the properties and activities of matter are can be known only through experience. Knowledge so acquired has the same validity when the matter examined is in the combinations called living, as in other conditions . . . if reproduction, regulation, sensation, thought, and the like so occur and are not identifiable with the activities of matter known in physics and chemistry, then they are merely to be added to the latter, on the same footing. It is a vulgar error to assume that if in certain combinations matter is 'inert and lifeless' it must be so in all. Matter has precisely the characteristics that we find it to have. Development, regulation, purpose, consciousness, reason—these are not annulled or altered by the discovery that they are bound up with the phenomena called matter; such discovery changes our knowledge of matter. It is no more and no less extraordinary that they should occur in connection with the phenomena we call matter than separately. What we find throughout the scale is that matter in certain combinations manifests certain activities; in other combinations, other activities. The more complex the combination the more complex and varied the activities. The union of many of the most complex substances in certain arrangements ('structure') gives the phenomena of life; observation of this fact stands on the same footing as observation of the gravitation or extensity of matter." In other words, the ascertained properties of *living* matter are properties of living *matter*. Now, if we choose to give the name of mechanism to the orderly procedure of matter wherever found, then mechanism is an adequate system of categories; but it must be remembered that it is, from the point of view of the development of knowledge, a growing system. We do not know all about mechanism and cannot predict with infallibility what under new conditions may occur. If on the contrary we mean by mechanism a definite number of already ascertained laws of material behavior, then mechanism is a partial truth, perhaps limited in its range just to those phenomena which have yielded to us the knowledge of these laws.

Much has been made of the opposition between mechanism and teleology. In this antithesis it is generally stated that a mechanistic view of the universe admits of the absolute predictability of the future, whereas the teleological view leaves room for unforeseeable novelties. If mechanism means predictability with the help of such laws as we have, then we must admit that mechanism is absolutely false. Nobody with our body of science can predict the future except in a most general fashion. But predictability presupposes *knowledge* of the laws in accordance with which an event is to occur, and an empiricist admits that laws must be obtained from experience. New laws therefore are possible, and the fact that prediction is impossible in the absence of knowledge of such laws is no proof that the unpredictable is not going to be determinate and orderly in its behavior. Mechanism as naturalism is thoroughly consistent with the recognition of purpose provided purpose occurs in accordance with law.

Among the most prominent recent opponents of mechanism the best known are Bergson and William James (qq.v.). Both have identified mechanism with predictability. In doing this they have had some justification in the claims of mechanists themselves.

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James, *Pluralistic Universe* (ib., 1909); Henri Bergson, *Time and Free Will*, translated from the French (ib., 1910); id., *Creative Evolution*, translated from the French (ib., 1911); William James, *The Will to Believe* (new ed., ib., 1912); J. S. Haldane, *Mechanism, Life, and Personality* (ib., 1914); Jennings, "Life and Matter," in *Johns Hopkins University, Circular No. 10*, N. S. (Baltimore, 1914).

MECHANOTHERAPY, mĕk'ȧ-nŏ-thĕr'ȧ-pĭ. A form of physical therapeutics which may be defined as a species of gymnastics in which the movements are applied mechanically with "fixed duration, direction, and purpose" (Ling) either by the hand of the operator or by means of specially devised machines. A systematic employment of such exercise is the object of the so-called Swedish movements, a development of massage. To Pehr Henrik Ling (q.v.), born in 1776, in Småland, Sweden, belongs the credit of systematizing this form of mechanical therapy. According to his definition a movement consists in a change of the body or part of it from one position to another under certain definite conditions, the movement beginning with a fixed position of the body except the part to be manipulated. Ling recognized five principal positions of the body (lying, kneeling, sitting, standing, and hanging), with many secondary positions; and three principal movements (flexion, extension, and rotation), with numerous subvarieties, all of these movements being in accordance with the natural motion of the parts. *Passive* movements are performed by the operator without the patient's volition. *Active* movements are performed by the patient of his own will and volition, unhindered and unaided by the operator. A *concentric* movement is made when the patient overcomes resistance while performing a movement; if, on the other hand, the patient resists the efforts of the operator to flex or rotate certain muscles the movement is called *eccentric*. According to a strict definition, massage is not included under mechanotherapy; but modern systems of physical therapeutics often combine the various movements with massage, baths, electricity, and vibration. The benefits derived are the same as those conferred by other forms of exercise (q.v.).

A great number of devices for self-massage or exercise have been introduced; the "cannon ball" for abdominal massage in cases of constipation is a familiar example. Rowing machines and pulleys, elastic or weighted, are found in most gymnasia. Mechanotherapy, however, has probably reached its highest development in the ingenious inventions of Dr. Gustaf Zander, of Stockholm. About the middle of the last century Zander introduced the first of these contrivances for administering the well-known Swedish movements. From crude beginnings he developed his system until he had perfected over 70 varieties of apparatus, some of them weighing nearly a ton, by which the most delicate child and the most unwieldy adult can be treated with equal ease and advantage. These machines range from a simple apparatus for moving a single joint or group of muscles to complicated mechanisms which closely imitate the motion of the body performed on horseback or even camel riding—the latter technically known as "trunk circumduction." Zander institutes have been established in all the important cities and health resorts in Europe, while in the United States some of the large hospitals have a department devoted to this work. Among these are the Neurological Hospital and the Montefiore Home in New York City and the Massachusetts General Hospital in Boston.

Mechanotherapy is not designed, nor should it be resorted to, as a substitute for the natural, unconscious exercise in the open air, such as is obtained in the various outdoor recreations, but is applicable to those suffering from general weakness, or from affections of particular portions of the body, such as local paralysis or joint affections, which would render general movement painful, harmful, or impossible. Another large class of persons who are likely to find benefit are those who are afflicted with deformities, due either to habit or disease. In such cases the orthopedist often finds a valuable ally in the "movement cure." The subject is intimately related to massage (q.v.). For fuller information, consult: Grafstrom, *Mechano-Therapy* (2d ed., Philadelphia, 1904); Nissen, *A Manual of Instruction for Giving Swedish Movement and Massage Treatment* (ib., 1906); Juettner, *Modern Physiotherapy* (Cincinnati, 1908).

MECHERINO, mȧ'kȧ-rē'nō, Il. A name sometimes applied to the Italian painter Domenico Beccafumi (q.v.).

MECHITARISTS. See Mekhitarists.

MECHLIN, mĕk'lĭn, or **MALINES.** One of the chief cities of the Province of Antwerp, Belgium, situated 13 miles south-southeast of the city of Antwerp, on the navigable river Dyle, which flows through the city in a number of arms (Map: Belgium, C 3). The city is circular in shape, has broad and regular streets, and is surrounded by a canal and a wide boulevard. As the see of the Cardinal Primate of Belgium, it retains a considerable ecclesiastical importance; of its numerous churches the most noteworthy is the cathedral of St. Romauld, a vast Gothic structure of the sixteenth century, adorned in the interior with many fine paintings and choice carvings, its altarpiece, "The Crucifixion," by Van Dyck being one of that master's finest works. Its chimes rival any in Belgium. One tower, 320 feet in height, remains unfinished. Other buildings are the churches of St. John and of Our Lady, the latter containing "The Adoration of the Magi" and the "Miraculous Draught of Fishes" by Rubens; the town hall, dating from the fifteenth century, and known as the Beyard; the palace of justice; the market hall, erected in 1340; the lodge of the Teutonic Order, the old cloth hall; and the splendid modern archiepiscopal palace. Mechlin has an archiepiscopal seminary with a library of 31,000 volumes, an academy of painting, an academy of music, a Gymnasium, an athenæum, a museum, and a botanical garden. It was formerly the seat of important lace manufactures, but its chief products now are caps and woolen goods, Gobelin tapestry, linen, furniture, carpets, candles, needles, large bells, tobacco, starch, and beer. There are also extensive railway shops outside the city. Mechlin was occupied by the Germans during their advance on Antwerp in the European War which broke out in 1914. It was recovered by the Belgians by a sally in force from Antwerp. After a heavy bombardment, which destroyed the greater part of the city, it again fell into the hands of the Germans. See War in Europe. Pop., 1900, 56,013; 1910, 59,191.

MECHLIN LACE. A lace so named from being originally manufactured at Mechlin in Belgium. It is a hexagon mesh of three threads

in which the pattern is worked. The mesh has four plaited and two twisted sides. See LACE.

MECK'EL'S GANGLION, or THE SPHENOPALATINE GANGLION. The largest of the four sympathetic ganglia connected with the fifth cranial nerve, the others being the ophthalmic (q.v.), the otic (q.v.), and the submaxillary (q.v.). It lies deep in the sphenomaxillary fossa (a small triangular space just beneath the apex of the orbit), close to the sphenopalatine foramen. The ganglion is a small triangular or heart-shaped body, of a reddish-gray color, and was first described by Meckel. Like the other ganglia of the fifth nerve, it possesses a motor, a sensory, and a sympathetic root. Its sensory root is derived from the superior maxillary branch of the fifth nerve, through its two sphenopalatine branches; its motor root from the facial nerve, through the large superficial petrosal nerve; and its sympathetic root from the carotid plexus, through the large deep petrosal nerve. The ganglion gives off branches of distribution in four groups—an ascending group, which passes to the orbit; a descending, to the palate; an internal, to the nose; and posterior branches to the pharynx and nasal fossæ. See NERVOUS SYSTEM AND BRAIN.

MECK'LENBURG DECLARATION OF INDEPENDENCE. In American history, a series of resolutions purporting to have been adopted at Charlotte, Mecklenburg Co., N. C., May 20, 1775, by a convention of delegates representing each militia company of the county. Another set of resolutions is attributed to a similar meeting on May 31, 1775, but the use at that time of both modes of reckoning time makes it probable that only one meeting was held, although this has always been a debatable question and has given rise to a detailed and prolonged controversy. The copy of the resolutions made by the secretary of the meeting is said to have been destroyed by fire in 1800, but on April 30, 1819, what purported to be a copy, made probably from recollection, was published in the Raleigh (N. C.) *Register*. The use of phrases in the published copy similar to certain passages in the real Declaration of Independence of July 4, 1776, caused doubt to arise as to the authenticity of the Mecklenburg Declaration. The Legislature of North Carolina in 1831, after an investigation of the subject, declared May 20 a legal holiday. The weight of authority at present is overwhelmingly against the authenticity of the Declaration and favors the opinion that only one meeting was held—the one of May 31—and that the resolutions there adopted, bearing no resemblance to Jefferson's Declaration, constitute the nearest approach there was to a Mecklenburg Declaration of Independence. The resolutions, as published in the Raleigh *Register* in 1819, are five in number. They declare: (1) that whoever aids or abets the invasion of American rights is "an enemy to this country—to America—and to the inherent and inalienable rights of man"; (2) that all political bonds between those passing the resolutions and the mother country are dissolved, the allegiance of the citizens of Mecklenburg County to the British crown being absolved and all political connection with that nation broken off; (3) that "we do hereby declare ourselves a free and independent people; are, and of a right ought to be, a self-governing association, under the control of no power other than that of our God and the general government of the Congress; to the maintenance of which independence we solemnly pledge to each other our mutual coöperation, our lives, our fortunes, and our most sacred honor"; (4) that those passing the resolutions acknowledge the existence of no law or public officer, but readopt their former laws in so far as these laws do not recognize the authority of the crown, thus vacating all civil and military commissions granted by the crown; and (5) that all military officers in the county are retained in their former command and that every member of the convention be henceforth a civil officer with power to issue process, hear and determine all matters of controversy, preserve peace and harmony, and endeavor to spread the love of country until a more general organized government be established in the province.

Bibliography. W. M. Hoyt, *The Mecklenburg Declaration of Independence* (New York, 1907), is an able study, and sufficient to convince most historians that the Declaration of May 20 is spurious. G. W. Graham, *The Mecklenburg Declaration of Independence, May 20, 1775, and Lives of its Signers* (New York, 1905), and J. H. Moore, *Defense of the Mecklenburg Declaration of Independence* (Raleigh, 1908), are the ablest attempts to prove that it is authentic.

MECKLENBURG-SCHWERIN, mĕk'lenburk-shvâ-rēn'. A grand duchy and constituent state of the German Empire, bounded by the Baltic Sea on the north, the Prussian Province of Pomerania and the Grand Duchy of Mecklenburg-Strelitz on the east, the Prussian provinces of Brandenburg and Hanover on the south, and Schleswig-Holstein, the Principality of Ratzeburg (belonging to Mecklenburg-Strelitz), and the territory of Lübeck on the west (Map: Germany, E 2). Area, including the three enclaves in Brandenburg and Mecklenburg-Strelitz, 5068 square miles.

The country is generally flat, with the exception of the central part, which is traversed from southeast to northwest by a chain of low hills, forming the watershed between the Elbe and the Baltic Sea. The flat coast line is 100 miles long and is broken by a number of deep indentations, including the Bay of Wismar. Numerous rivers traverse the country from north to south. The Recknitz, the Warnow, and the Stepenitz flow towards the Baltic, and the New Elde and the Sude are tributaries of the Elbe, which for a few miles forms the south boundary of the grand duchy. The country abounds in lakes (650 in round numbers) of glacial origin, the largest of which are the Müritz See (51 square miles), the Schweriner See (23 square miles), the Kölpiner, and the Plauer See.

The climate is mild and healthful, although somewhat raw. The average annual temperature is 46° F. and the annual precipitation 21 inches. There are chalybeate springs at Doberan and Goldberg and saline springs at Sülze. According to the industrial census of 1907 nearly one-half of the population depended for their livelihood on agriculture. The land is divided between the crown, the aristocracy, the clergy, and the towns, the peasantry forming an hereditary tenantry class. About 90 per cent of the area is under cultivation in pastures and in forests. The crops exceed the local demand and are partly exported. Rye, wheat, oats, barley, sugar beets, and potatoes are the staples. Tobacco is cultivated to some extent. Stock raising is carried on extensively, and dairying is an important adjunct to agriculture.

The manufacturing industries are far inferior to the agricultural interests. There are a number of foundries, machine works, sugar refineries, breweries, distilleries, paper mills, tanneries, tobacco factories, brickyards, etc.; but many manufactures are imported for local consumption, and the native exports contain no manufactured product of importance. The trade is very extensive and favored by the situation of the country. The imports pass chiefly through the seaports of Warnemünde and Wismar. The chief exports are agricultural, dairy, and animal products, live animals, etc., and are transported mostly by rail. The outward and inward shipping was 2,429,963 tons in 1910. The transportation facilities are excellent, consisting of a system of navigable rivers and canals and a number of state railway lines with a total length of 1094 miles in 1914.

The constitution of the two duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz is based on the agreement concluded in 1755 between the Duke of Mecklenburg-Schwerin and his estates and adopted in the same year by the Duchy of Mecklenburg-Strelitz. The crown is hereditary in the male line in both duchies and on the extinction of the reigning dynasty in either state the succession reverts to the other house. In the case of the extinction of both houses the right of succession passes to Prussia. The government of the two Mecklenburgs is semifeudal in character, and the proprietors of the land, whether belonging to the nobility or not, are endowed with many special privileges. The common assembly, or Landesunion, of both grand duchies consists of the representatives of the landed aristocracy, or Ritterschaft, and the burgomasters of 49 towns, or the Landschaft. The tenants of the royal domains are not represented.

The assembly convenes every year for a short period, alternately at Sternberg and at Malchin. There are also a permanent committee of nine members at Rostock representing the two estates when the Landtag is not in session, and convocation and deputation diets which can be assembled for special purposes in either of the duchies. The Principality of Ratzeburg is under the direct authority of the Grand Duke of Mecklenburg-Strelitz. The executive authority in Mecklenburg-Schwerin is vested in a cabinet of four ministers. Mecklenburg-Schwerin is represented by two members in the Bundesrat and sends six deputies to the Reichstag. These are the only elective offices in the duchy. The capital is Schwerin; the summer residence of the Grand Duke is Ludwigslust.

The two duchies have two separate systems of lower courts and a common supreme court at Rostock. There is no general financial system in the Grand Duchy of Mecklenburg-Schwerin. The revenue is divided into three classes, of which by far the largest (derived from the royal domains and ordinary taxes) is under the sole control of the Grand Duke. A part of it goes to cover the ordinary expenses of the government. The total public debt, incurred to some extent for the purchase of railways, amounted to approximately $32,717,025 on July 1, 1913. General and technical education is on a high plane. The university at Rostock (q.v.) provides higher education. Pop., 1900, 607,770; 1910, 639,958, of which 96 per cent were Protestant.

History. The territory of Mecklenburg was anciently occupied by Germanic peoples, and at the beginning of the Middle Ages the Wends, Obotrites, and other Slavic tribes took possession of the region. The Slavic inhabitants long resisted the power of Germany, but were finally subdued in the second half of the twelfth century by Henry the Lion, Duke of Saxony. Henry left a part of the country (which took its name from Michilenburg, the principal settlement of the Obotrites, near the modern Wismar) under the rule of the Obotrite princes, while at the same time the Germanization of the region was prosecuted. After 1229 the territory was frequently divided and subdivided among the descendants of the original Slavic rulers. In 1348 Mecklenburg was elevated into a duchy by the Emperor Charles IV. In 1363 Albert III, Duke of Mecklenburg, was called to the throne of Sweden, but in 1389 was dethroned by Margaret, Queen of Denmark and Norway. In the middle of the sixteenth century Lutheranism was made the established religion in Mecklenburg. About this time there was a division into the two ducal lines of Mecklenburg-Schwerin and Mecklenburg-Güstrow. In the Thirty Years' War the dukes of Mecklenburg joined Christian IV of Denmark in the struggle against the Roman Catholic powers and, as a result, were deprived of their possessions, which were conferred in 1629 upon Wallenstein. In 1631, however, the dukes were restored by Gustavus Adolphus of Sweden. After various subdivisions of the ducal line into the branches of Schwerin, Strelitz, and others, and the successive extinction of several of these collateral houses, the Imperial Commission, which met at Hamburg in 1701, brought about a family compact, by which it was arranged that Schwerin and Güstrow should form one duchy and Strelitz with Ratzeburg, Stargard, etc., another. In 1815 the dukes of both the Mecklenburgs assumed the title of Grand Duke. Frederick Francis (1785–1837), Grand Duke of Mecklenburg-Schwerin, abolished serfdom in his dominions, to which he added Wismar. The reign of Frederick Francis II (1842–83) of the same duchy, who succeeded his father, Paul Frederick, was disturbed by a contest between the nobles and the burghers and smaller landowners. The revolutionary movement of 1848 gave a fresh stimulus to the popular ferment in both duchies, and the disturbances could only be quelled by the intervention of the Prussian troops; but a reaction took place in 1850 and matters were restored to their former condition. Frederick Francis II (q.v), Grand Duke of Mecklenburg-Schwerin, was one of the principal generals in the Franco-German War of 1870–71. As members of the German Empire, the two duchies have maintained their internal constitution very much on the old footing. Consult Wilhelm Raabe, *Mecklenburgische Vaterlandskunde* (2d ed., 3 vols., Wismar, 1894–96).

MECKLENBURG-STRELITZ, -strā'lĭts. A grand duchy and constituent state of the German Empire, consisting of the grand duchy proper, bounded by the Prussian provinces of Pomerania and Brandenburg and the Grand Duchy of Mecklenburg-Schwerin, and of the Principality of Ratzeburg, which is separated from it by the width of Mecklenburg-Schwerin and bounded by Lauenburg and the free town of Lübeck (Map: Germany, E 2). Total area, 1131 square miles. In the formation of its surface the grand duchy proper resembles Mecklenburg-Schwerin. It is watered chiefly by the Havel and the Datze and contains numerous

lakes. The Principality of Ratzeburg is watered by a tributary of the Stepenitz.

Agriculture is the chief occupation, and the system of land tenure does not differ from that prevailing in the Grand Duchy of Mecklenburg-Schwerin, though the trade is less developed, but there is considerable inland traffic, and the railway facilities are good. Mecklenburg-Strelitz is governed by the same constitution as Mecklenburg-Schwerin (q.v.). The executive power is vested in a Minister of State and a small council. Capital, Neustrelitz. The financial system also resembles that of Mecklenburg-Schwerin. Mecklenburg-Strelitz is represented by one member in the Bundesrat and returns one deputy to the Reichstag. Pop., 1910, 106,347, almost exclusively Protestant. For history, see MECKLENBURG-SCHWERIN.

MECON'IC ACID (Gk. *μηκωνικός, mēkōnikos,* pertaining to the poppy, from *μήκων, mēkōn,* poppy), $C_7H_4O_7 + 3H_2O$. An acid existing in opium, which, when good, yields from 6 to 8 per cent of it. Both the acid and its salts assume a characteristic blood-red tint with ferric salts; and this test, which is very sensitive, is employed by the toxicologist in searching for traces of opium. As, however, the alkaline sulphocyanides which exist normally in the saliva give a precisely similar tint with the ferric salts, it is necessary to be able to distinguish the meconate or iron from the sulphocyanide of iron. A solution of chloride of gold or of corrosive sublimate removes all doubt by discharging the color of the sulphocyanide but not affecting the color of the meconate of iron. The constitution of meconic acid is represented by the formula C_5HO_2 (OH) $(COOH)_2$, showing it to be chemically a monohydroxy-dibasic acid. The alkaloids morphine, codeine, narcotine, thebaine, papaverine, and others exist in opium in combination partly with meconic, partly with sulphuric, acid.

MECO'NIUM (Lat., from Gk. *μηκώνιον, mēkōnion,* poppy juice, from *μήκων, mēkon,* poppy). The earliest matter discharged from the bowels of a newborn infant. It is of a brownish-green or almost black color, acid, devoid of odor, and rapidly putrefies on exposure to air. It is usually regarded as a product of the fœtal liver. It contains biliary salts and bile pigments and an abundance of desquamated epithelium of a green tint, of mucus corpuscles, and of fat, with which there is a good deal of cholesterine (7 per cent).

MEDAD. See ELDAD AND MEDAD.

MEDAL (OF. *medaille,* Fr. *médaille,* from Lat. *metallum,* from Gk. *μέταλλον,* metal). A piece of metal, more or less of the form of a coin, stamped on one side or both with image and inscription, with the object of commemorating an event or of honoring a person, and not intended for circulation as money. This use of the word excludes all ancient and modern coins, even those which, like the American Columbian half dollar, are commemorative pieces struck only for a special occasion but designed for circulation as money. The coins of the Greeks and the Romans have so many medallic, i.e., commemorative, characteristics, that the belief once held that they were really medals rather than coins was a natural one; as a result of that belief the word medal long meant coin, as in the title of Addison's *Dialogues on Medals.* (See NUMISMATICS, *Material of the Study; Nomenclatures.*) There is hardly any event of popular interest, whether public or private, in ancient times, especially under the Roman Empire, that is not recorded on the coins. The term *medallion* is for convenience still used of certain classes of ancient coins that surpass the rest in size and technique; but the strictly monetary character of even these is now sufficiently proved. Though objects of real art, often designed for royal gifts or for ornament, they were still multiples of the regular coins, and as such could be entered into circulation. Such were the magnificent "medallions" of Syracuse, real gems of the die engraver's art signed with the artist's name, and the "medallions" in gold, silver, and copper of the Roman Emperors, coined under their special control, and hence lacking the usual S. C. (*Senatus consulto,* "by order of the Senate") of the senatorial bronze money. Sometimes these Roman medallions are found set in a circlet of fine metal. This was not the work of the coiner, however, but of the jeweler who adapted the coin to artistic use. For another use of the term "medallion," see MEDALLION. If we are to seek anything approximating the medal in ancient times, it may perhaps be found in certain pagan talismans and in the little Christian medals of devotion.

Modern medals begin in the period of the Renaissance. The earliest bear the portraits and inscriptions (in Latin) of rulers and potentates. The subjects are at first drawn exclusively from classical art; hence their value as documents of contemporary history, though not as documents of art, is materially lessened. The most famous Italian medalist of the fifteenth century was Vittorio Pisani, of Verona, whose splendid works are signed "Opus Pisani Pictoris." It became the custom for a ruler to inaugurate his reign and celebrate its chief events by striking medals. The series of the popes begins with Paul II (1464–71) and continues without a break to the present time. Medals of popes earlier than Paul II are the work of a later period. A medallic mint is connected with the Vatican, where the best artists are employed. Some of the medals of Julius II, Leo X, and Clement VII have an especial interest as having been designed by Raphael and Giulio Romano and engraved by Benvenuto Cellini. A sixteenth-century medal of Sicily is probably the first instance in modern times of the use of a medal as a vehicle of political satire; it is directed by Frederic II against his adversary, Ferdinand of Spain. Satirical medals were afterward common in the Low Countries. Some of the Dutch medals are noted for the elaborate views, maps, and plans engraved on them. Of many reigns a complete medallic history can be written, as, e.g., of that of Napoleon Bonaparte. American Presidents, beginning with Washington, are commemorated in a series of portrait medals. But it is no longer merely kings and rulers and great military and naval events that are commemorated in medals. Events of general interest in science, art, or literature, movements for the amelioration of conditions, learned societies, are all found recorded in these artistic little documents of history.

Besides the purely commemorative medals there is another class—that of "decorations"—which, beginning at the end of the eighteenth century, has attained an enormous development. These are conferred by the sovereign or the state as marks of distinction for eminent services, particularly in the army and the navy. Such

medals of honor are seldom of much intrinsic value, their worth depending mainly on the associations connected with them. They have ribbons attached, with clasps or small bars, each of which often bears the name of a battle. Such medals are intended to be worn on the breast. They are of very varied form, the cross being the most common. See LEGION OF HONOR; MEDAL OF HONOR, UNITED STATES; MEDAL OF HONOR LEGION; ORDERS; VICTORIA CROSS.

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MEDAL'LION (Fr. *médaillon*, augmentative of *médaille*, medal). In architecture, a circular or oval panel carved in bas-relief with a head, bust, figure, ornamental design, etc. The term is also used of a similar design in color.

MEDAL OF HONOR, UNITED STATES. The medal of honor of the United States, given for bravery on the field of battle, was first instituted in 1862 by a law approved July 12 of that year. It is authorized by Congress and is awarded in the name of Congress for particular deeds of most distinguished gallantry in action. The New Medal of Honor, adopted 1905, is a five-pointed star of rose-gold finish. On the medallion in centre is the head of Minerva in bold relief, surrounded by a band bearing the inscription "United States of America." Upon each point of the star is an oak leaf. The star is encircled by a green-enamel laurel wreath. Surmounting the star and wreath is an eagle resting on a bar, upon which "Valor" is in raised letters. The decoration is pendent from a concealed pin by blue-silk watered ribbon, upon which are emblazoned 13 stars in white. The reverse side is plain for engraving the name of recipient, which is preceded by the inscription "The Congress to ———." The medal is worn with the full-dress uniform and the special evening dress, pendent from the neck about 1 inch below the opening of the collar. It will not be worn by officers suspended from rank and command, nor by enlisted men serving sentence of confinement. On March 25, 1776, before even independence had been proclaimed, Congress ordered that a gold medal be struck and presented to General Washington. Benjamin Franklin, who at the time was in Paris, was instructed to employ the greatest artists in France to execute a suitable design. Although this was the first medal voted, the first one struck was a silver medal presented to Lieutenant Colonel Fleury, a volunteer officer from the French regular army, who, entering the United States army in 1777 as a private, distinguished himself so greatly and rendered such valuable services that Congress promoted him to be lieutenant colonel. For his gallantry in the assault upon Stony Point, July 15, 1779, Congress voted him a silver medal, and afterward a vote of thanks. It was not until the institution of the medal of honor that the United States possessed a military equivalent to the Victoria cross (q.v.) of England or the iron cross (q.v.) of Prussia. Like the former decoration, it is bestowed on both commissioned and noncommissioned ranks alike, the decoration being the same in every instance. Medals of honor are only awarded to officers or enlisted men for most distinguished personal bravery or self-sacrifice which has been manifested in action, by conduct distinguished above the others, and that involved risk of life, or service more than ordinarily hazardous the omission of which would not justly subject the person to censure. An interesting account of the deeds by which the medal of honor has been won will be found in Rodenbough, *Uncle Sam's Medal of Honor* (New York, 1886). Consult *United States Army Regulations*, 1913.

MEDAL OF HONOR LEGION. A patriotic society whose membership comprises officers and enlisted men who have received the medal of honor (q.v.). The society was originally organized in 1890 to admit those who had participated in the Civil War, but the membership was subsequently extended to include all who have received the medal of honor, regardless of the war in which they engaged. The number of members on the rolls in December, 1914, was about 400.

MEDANO, mä-dä'nō. A Spanish term applied to the curious traveling, crescent-shaped sand hills which occur in numbers on the elevated pampa of Islay, near Arequipa, Peru. They move across the desert from south to north in the direction of the prevailing day wind. They are composed of a white sand apparently quite different from that which makes up the rest of the desert surface.

MED'ARY, SAMUEL (1801–64). An American editor and politician. He was born in Montgomery Co., Pa., and began newspaper work at 16 years of age. In 1825 he removed to Ohio and in 1828 became editor of the *Ohio Sun*, a Democratic paper. After serving in both Houses of the Ohio Legislature he was editor from 1836 to 1857 of the *Ohio Statesman*, which became a great power in the West and Southwest. He was high in the confidence of President Jackson and the succeeding Democratic Presidents, and is said to have originated the phrase "Fifty-four forty or fight" during the Oregon boundary dispute. In 1844 he was chairman of the Democratic National Convention held at Baltimore and secured the enthusiastic nomination of James K. Polk for the presidency by reading a letter from Andrew Jackson in which Polk was recommended for that office. In 1853 Medary declined the position of United States Minister to Chile. He was the last territorial Governor of Minnesota in 1857–58, was postmaster of Columbus, Ohio, in 1858, and was Governor of Kansas Territory in 1859–60, when he resigned to found the *Crisis*, which he continued to edit until his death. The Ohio State fairs owe their origin largely to him. He helped Samuel F. B. Morse

in his struggle to make a success of the electric telegraph. The Democrats of Ohio erected a handsome monument to Medary's memory at Columbus.

MEDE, Joseph. See Mead, Joseph.

MEDE'A (Lat., from Gk. Μήδεια, *Mēdeia*). In Grecian legend, a famous sorceress, the daughter of Æetes, King of Colchis, and of the Oceanid Idyia, or of Hecate, and niece of Circe. On the arrival of the Argonauts (q.v.) at the court of Æetes, in search of the Golden Fleece, she fell in love with Jason, aided him by her magic arts to perform the tasks set him, and finally to carry off the fleece. Pursued in her flight with the Argonauts by her father, she killed her brother Absyrtos and scattered the fragments of his body on the sea. Since her father paused to gather up the remains, the Argonauts gained time for their escape. On the return of Jason to Iolcus, she aided him to take vengeance on Pelias, who had murdered Jason's parents. Having cut up an old sheep and boiled the pieces with magic herbs, she brought forth from the caldron a young lamb, an incident represented not infrequently on Greek vases. She then easily persuaded the daughters of Pelias to cut their father in pieces, that by the same process he might regain his youth; but when they had yielded she refused to employ her art. For this she and Jason were forced to flee to Corinth, where Jason repudiated Medea to marry Glauce, or Creusa, the daughter of the King. Medea sent her rival a poisoned robe and crown, whereby both the princess and her father were destroyed. To complete her revenge, she then slew the children she had borne Jason, and fled on her dragon chariot to Athens, where she was received by King Ægeus, to whom some said she bore a son, Medos. On the arrival from Trœzen of Theseus, the son of Ægeus, she plotted against his life, but was discovered, and with her son fled back to Colchis and restored her father to the throne, of which he had been deprived by his brother Perses. Story said also that Medos gave his name to the Medes. As a sorceress she seems, like Circe, immortal in some of the writers, while others regarded her as a heroine and united her to Achilles in the Elysian fields. These outlines of the legend were often very variously filled in, and it is clear that in the story many elements are combined. Much points to an original divinity sunk to heroine (she was honored as a goddess at Corinth), as is so often the case, and much also to an original good sorceress, a counterpoise to the wicked Circe. Medea was especially honored in Thessaly, the home of magic. The attempts to interpret the myth in the light of natural phenomena (some scholars have regarded Medea as a moon goddess) cannot be regarded as successful. The figure of Medea was a favorite one in art, especially with the vase painters. The Corinthian episode is common on Roman sarcophagi. It attained especial prominence through the great tragedy *Medea*, by Euripides (q.v.). Medea's story is told at length by Ovid, *Metamorphoses*, vii, 1–348, and *Heroides*, xii. Ovid also wrote a tragedy called *Medea*, as did Seneca the philosopher; of these the latter is extant, but the former is lost. The story of Medea has been handled in modern times by T. Corneille and F. Grillparzer, and in an opera by Cherubini. Consult: Léon Mallinger, *Médée: étude sur la littérature comparée* (Paris, 1898); the editions of the *Argonautica* of Apollonius Rhodius and of the *Medea* of Euripides, especially the edition of the latter by M. L. Earle, pp. 32–62 (New York, 1904); the article "Medeia" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MEDEA. 1. A tragedy by Euripides represented in 431 B.C., when it obtained only the third prize. The delineation of the passionate heroine makes it one of the most famous of Greek tragedies. Euripides' *Medea* was translated into Latin by Ennius. 2. A play of considerable power by Seneca, 1027 lines in length. It is only occasionally like the play of Euripides. It is distinguished by the beauty of its choral odes. 3. A tragedy by Richard Glover (1761).

MÉDECIN MALGRÉ LUI, mā'd'săn' mâl'-grā' lwē, Le (Fr., The Physician in Spite of Himself). A three-act farce comedy in prose by Molière, produced at the Palais Royal in 1666. The plot is taken from an old fabliau of the thirteenth century, *Le médecin de Bray* or *Le vilain mire.* The comedy was set to music by Gounod and presented at the Opéra Comique in 1858. It was given in London as "The Mock Doctor" in 1865.

MÉDECIN VOLANT, vō'län', Le (Fr., The Flying Doctor). A comedy by Molière (1659).

MÉDÉE, mā'dā' (Fr., Medea). The title of several French tragedies inspired by the *Medea* of Euripides. 1. A play by Jean de la Péruse (1553), a translation of Seneca's version of the tragedy. 2. A tragedy by Pierre Corneille (1635), based on Euripides with an admixture of Seneca, but with a number of new minor characters and with variations in the details of the plot. 3. A play by Clément (1779) which eliminates the supernatural features. 4. A play by Catulle Mendès, produced at the Renaissance in 1898 with Sarah Bernhardt in the title-rôle. It is based on Euripides and Seneca, with modifications ingeniously introduced.

MEDELLÍN, mā'dā-lyēn'. The capital of the Department of Antioquia, Colombia, situated between the ranges of the central and western Cordilleras (Map: Colombia, B 2). It is a beautiful town, and, its elevation being about 5000 feet above sea level, the climate is pleasant. Its streets are broad and straight and it has several parks and squares adorned with handsome buildings, among which are a number of churches, a high school, a museum, and a public library. It has a college, a seminary, a school of mines, two normal schools, and a number of private schools. The manufactures of the city include cloth and clothing, chocolate, matches, cigarettes, shoes, clocks, paper, and articles of gold and silver. There are also a number of foundries. It is a growing commercial centre and is the residence of a United States consular agent. Medellín was founded in 1674. Pop., 1912, 70,547. Consult *Censo general de la república de Colombia* (Bogotá, 1912).

MEDES, mēdz. See Media.

MEDFIELD. A town in Norfolk Co., Mass., 18 miles by rail southwest of Boston, on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 4). It contains the Medfield State Hospital. There are manufactories of straw hats and bricks. Medfield is the birthplace of Hannah Adams, the historian, who was one of the pioneer literary women of America. Pop., 1900, 2926; 1910, 3466.

MED'FORD. A city, including the villages of Hillside, Glenwood, South Medford, Welling-

ton, and West Medford, in Middlesex Co., Mass., 5 miles north by west of Boston, on the Mystic River and on the southern and western divisions of the Boston and Maine Railroad (Map: Massachusetts, E 3). The city, which extends 4 miles in length and breadth and occupies an area of about 8 square miles, is a popular residential suburb of Boston, and the seat of Tufts College (q.v.). It has a public library; several historically interesting buildings, of which the old Cradock House, built in 1634, is said to be the oldest structure retaining its original form in the United States; Royall House; Middlesex Fells Park, Mystic Valley Parkway, Brooks Playstead, Salem Street Common, and several smaller parks; and several cemeteries, the largest of which, Oak Grove, contains about 34 acres. The principal manufactures include carriages, bricks, machinery, chemicals, dyes, calico, etc. The government is administered under the revised charter of 1903, which provides for a mayor, elected every two years, a board of aldermen, consisting of 21 members, elected for one year, seven of whom are elected at large and 14 by wards, and subordinate administrative officials. The water works are owned by the city. Pop., 1890, 11,079; 1900, 18,244; 1910, 23,150; 1914 (U. S. est.), 25,240; 1920, 39,038. Founded as Meadford by a company from Salem in 1630, Medford became a town in the following year and was chartered as a city in 1892. Consult Usher, *History of the Town of Medford, Mass.* (Boston, 1886).

MEDFORD. A city in Jackson Co., Oreg., 5 miles east of Jacksonville, on the Southern Pacific, the Pacific and Eastern, and the Rogue River Valley railroads (Map: Oregon, C 5). It contains a Carnegie library, fine Federal and high-school buildings, the Sacred Heart Hospital, St. Mary's Academy, city parks, a United States Weather Bureau station, and is adjacent to the picturesque Crater Lake, National Park, and Sugar Pine forests. Pears and apples are grown in the surrounding region and shipped from Medford in large quantities. The water-supply system, comprising 28 miles of mains, and erected at a cost of $350,000, is owned by the municipality. Pop., 1900, 1791; 1910, 8840; 1914 (U. S. est.), 12,490.

MED'HURST, Walter Henry (1796–1857). An English Congregational missionary. He was born in London and went, by appointment of the London Missionary Society in 1816, to Malacca as a missionary printer. His fitness for the ministry induced the missionaries to ordain him in 1819, and he did good service in various Eastern fields, Malacca, Penang, Batavia, Parapattan, and, from 1842 to 1856, at Shanghai. For six years he performed mission work in the interior of China amid much peril. In 1847 delegates from several stations convened in Shanghai for the revision of the New Testament. In this work he was engaged until 1850, when he devoted his time to the Old Testament. In 1857 he returned to England in impaired health and died three days after his arrival. He was well versed in the Chinese, Japanese, Javanese, and other languages, besides Dutch and French, in all of which he wrote. His special works are: *An English and Japanese Vocabulary* (1830); *Dictionary of the Hokkien Dialect* (1832); *China: Its State and Prospects, with Especial Reference to the Diffusion of the Gospel* (1838); *A Chinese and English Dictionary* (1842–43); *Chinese Dialogues* (1844; new ed., 1861); *Dissertation on the Theology of the Chinese* (1847); *English and Chinese Dictionary* (1847–48).

MEDIA, mē'dĭ-ȧ. A borough and the county seat of Delaware Co., Pa., 12 miles west of Philadelphia, on the Philadelphia, Baltimore, and Washington Railroad (Map: Pennsylvania, L 8). It is finely situated in a fertile and picturesque region and is a popular residential suburb of Philadelphia and a summer resort. The Delaware County Institute of Science, founded in 1833, has a valuable scientific library of 5000 volumes, and there are a public library and a splendid county courthouse building. The water works are owned by the municipality, also the street-lighting plant. Media, first incorporated in 1850, is governed by a chief burgess and a town council. Pop., 1900, 3075; 1910, 3562.

ME'DIA (Lat., from Gk. Μηδία, from Μῆδος, *Mēdos*, from OPers. *Māda*, Mede). In ancient times, the name of the northwestern part of Iran, bounded by the Caspian Sea on the north, by Persia on the south, by Parthia on the east, and by Assyria on the west. The northern portion of the country is very mountainous; the south is a rich and fertile tract. Media covered probably the present Persian provinces of Azerbaijan, Ghilan, Ardilan, and Irak-Ajemi, and the northern portion of Luristan.

The Medians were in language, religion, and manners very nearly allied to the Persians. After they had shaken off the yoke of the Assyrians their tribes united, according to Herodotus, about 708 B.C. under Deioces, whom later Persian tradition seeks to identify with Kai Kobad. Deioces made Ecbatana (q.v.) his capital. He was succeeded by his son Phraortes (647–625 B.C.), whose name has been brought into possible connection with the early history of Zoroastrianism. The King who followed was his son Cyaxares, who reigned 625–585 B.C. (See Cyaxares I.) This monarch, in alliance with Nabopolassar, King of Babylon, overthrew the Assyrian Empire about 604 B.C., spread the terror of his arms as far as Egypt and the farthest bounds of Asia Minor, and vanquished the brigand hordes of Scythia, who had extended their ravages to Syria. He was succeeded by his son Astyages (585–549), in whom the later tradition apparently wrongly seeks to recognize the tyrant Azh-dahak, or Azhi-dahaka, of Babylon, who was overthrown by Cyrus (q.v.). Persia now became the mistress instead of the vassal of Media, and from this time the two nations are spoken of as one people. After the death of Alexander the Great (323 B.C.) the new portion of Media became a separate kingdom, *Media Minor*, and existed till the time of Augustus, the other portion, under the name of *Media Major*, forming a part of the Syrian monarchy. Media was on several occasions separated from Persia. In 152 B.C. Mithridates I took Great Media from the Syrians and annexed it to the Parthian Empire, and about 36 B.C. it had a king of its own, named Artavasdes, against whom Mark Antony made war. Under the Sassanian dynasty the whole of Media was united to Persia. It became, during the fourteenth and fifteenth centuries, the stronghold of the Turcoman tribes Kara-Koinlu (Black Sheep) and Ak-Koinlu (White Sheep).

In early times the Medes were a warlike race, possessed of an enthusiastic love of independence, and distinguished for their skill with the bow. They were also celebrated for their

horsemanship, and it was from them that the Persians adopted this and other favorite exercises and acquirements. Media played an important part in the early religious history of the East, when we consider that the Magi sprang from Media and Zoroaster probably arose there, although part of his activity is located in Bactria.

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ME'DIANT (It. *mediante*, from Lat. *mediare*, to divide in the middle, from *medius*, middle). The third degree of the musical scale. The chord of the mediant is the triad built upon the third degree. In mediæval music, the tone that lies midway between the final and dominant. See MODES.

MEDIASTINUM, mē'dĭ-ăs-tī'nŭm. The space in the thorax between the lungs, divided by the heart into an anterior and a posterior portion. The anterior, which is the smaller, is occupied by the thymus gland, together with muscular and areolar tissues. The posterior or larger portion contains certain very important structures, viz., the aorta, thoracic duct, the œsophagus, trachea, the splanchnic nerves and some lymphatic glands, together with the nerves and arteries supplying them. A middle mediastinum, containing the heart and the origin of the great blood vessels and the bifurcation of the trachea, is sometimes described. The mediastinum is important surgically from its difficulty of access, the grave conditions sometimes developed in it and the difficulty of their diagnosis. The most frequent diseases developing in the mediastinum are inflammation and abscess, emphysema, aneurism, various tumors, tubercular glands and syphilitic gummata. Malignant growths in the mediastinum are apt to progress very rapidly, and in their early stages the diagnosis is obscure. In children an enlarged thymus gland may fill the anterior mediastinum, and in adults goitres sometimes extend into this space. The symptoms of growths in the mediastinum are those of mechanical pressure upon the important nerves, arteries, and other structures immediately adjacent. Among these may be mentioned cough, hæmoptysis, severe neuralgic pains, and difficult breathing.

ME'DIATE (Lat. *mediatus*, p.p. of *mediare*, to divide in the middle). Under the feudal system, and especially in Germany, a term applied to those lordships or possessions which were held by feudal tenure under one of the greater vassals, and so only *mediately* under the Emperor as the supreme feudal lord. The wars of the French Revolution and Napoleon resulted in many small German states being mediatized, i.e., annexed to larger ones. When the Confederation of the Rhine was formed by Napoleon in 1806 many German cities and ecclesiastical as well as secular states were consolidated.

MEDIATE INFERENCE. See LOGIC.

MEDIATION. In international law the attempt of a friendly power or the sovereign of such a power to compose differences which have arisen between two or more other powers. Mediation must be distinguished from *intervention* by the fact that the latter is always an unfriendly or at least an unwelcome act, involving usually the employment of force or the threat of force. It should also be distinguished from *good offices*, which consist in suggestions or advice made to governments at variance with each other for the purpose of inducing them by negotiation or otherwise to adjust their differences amicably, whereas mediation is more in the nature of a diplomatic intervention whereby the mediating power takes an active part in the controversy and, by submitting proposals on its own initiative to the powers at variance, by acting for both in the exchange of proposals and otherwise, seeks to compose and adjust the differences between them. In the spring of 1915 the good offices of the United States were being exercised in the protection of the interests of enemy subjects in the several belligerent states of Europe. The action of the Pope in suggesting the exchange of disabled prisoners of war by certain of the belligerent powers was also the exercise of his good offices. The action of President Roosevelt in bringing the governments of Russia and Japan to participate in the Peace Conference of Portsmouth in 1905, as well as his coöperation in securing the adoption of proposals on one side and the other, was a good instance of mediation.

With the design of increasing the resort to mediation as a means of settling international differences and of making the process more effective, The Hague conferences of 1899 and 1907 sought to regularize the procedure and give it a defined status in international law by laying down certain rules for its use. The provisions adopted are as follows:

"In case of serious disagreement or dispute, before an appeal to arms, the contracting powers agree to have recourse, so far as circumstances allow, to the good offices or mediation of one or more friendly powers. . . . Independently of this recourse, the contracting powers deem it expedient and desirable that one or more powers, strangers to the dispute, should, on their own initiative and as far as circumstances may allow, offer their good offices or mediation to the states at variance. . . . Powers, strangers to the dispute, have the right to offer good offices or mediation, even during the course of hostilities.

"The exercise of this right can never be regarded by either of the parties at variance as an unfriendly act.

"The part of the mediator consists in reconciling the opposing claims and appeasing the feelings of resentment which may have arisen between the states at variance." (Convention for the Pacific Settlement of International Disputes (1907), Articles 2, 3, and 4.)

The mediation contemplated by these provisions has come to be known as "special mediation." In view of the failure of the efforts made by Sir Edward Grey, the British foreign secretary, and by other friendly powers to mediate between Austria-Hungary and Servia, and thus to avert the War of the Nations in the summer of 1914, it may be doubted whether The Hague provisions have accomplished their purpose of making mediation a really effective means of adjusting serious differences between nations. See INTERNATIONAL LAW, and consult the authorities there referred to.

MEDIC, or MEDICAGO. See HEDGEHOG PLANT.

MEDICA'GO. A genus of annual or perennial leguminous plants of wide distribution, some of the species of which are valuable forage plants, as alfalfa, medick, bur clover, and snail clover. There are about 50 species of medicago, most of which are native of Europe, Asia, and western Africa. There are about half a dozen species rather widely disseminated in the United States and since 1906 a number have been introduced from Russia and Siberia as forage plants for the northern Great Plains region. Among the species so introduced are *Medicago falcata*, *Medicago ruthenica*, *Medicago platycarpa*, and *Medicago media*. Some of these appear quite hardy and can grow with less rainfall than others and as a consequence are considered a valuable acquisition in the Dakotas and elsewhere. See MEDICK.

MEDICAL ASSOCIATION, AMERICAN. An association organized in 1847, and having in 1915 a membership of about 77,000, of whom 42,630 are fellows. Its annual sessions are held in the different large cities of the United States, but the headquarters are in Chicago, Ill., where the weekly *Journal* is published. The business body, the house of delegates, is composed of 150 members from the various State associations and from various branches of the Federal medical service. The object of the association is to promote the science and art of medicine. Its scientific work is conducted through 15 sections.

MEDICAL CODE. A collection of rules governing professional conduct, based upon medical history and tradition. The Code of Medical Ethics was adopted in due form by the American Medical Association in 1847, and was ratified by all the regular State and territorial medical associations of the United States. The medical departments of the army, navy, and public-health service of the United States are represented by delegates at the meetings of the national association. The articles of the code describe in detail the duties of physicians to their patients, the duties of physicians to each other and to the profession at large, the duties of physicians in regard to consultations and compensation, and the duties of the profession to the public. This code was in effect without change or amendment from 1847 to 1903—56 years. In 1882 the Medical Society of the State of New York refused to be governed by the medical code, especially the sections relating to consultations, and as a result its delegates were refused admittance to the meetings of the American Medical Association. To meet the situation thus created the New York State Medical Association was founded as the constituent State body of the national association. In 1902, at the annual meeting of the national body held at Saratoga, N. Y., the delegation of the New York State Medical Association introduced a complete revision of the Code of Medical Ethics which modified the objectionable features of the article on consultations. The revision was unanimously adopted at the meeting in New Orleans the following year. The revision called for a change from the Code of Medical Ethics with its regulations and penalties to the Principles of Medical Ethics, which are suggestive and advisory. The revision considers the American Medical Association as holding a relation to its constituent State and territorial medical associations analogous to that of the United States through its Constitution to the several States and Territories. Large discretionary powers are left to the respective State and territorial associations to form such rules governing the professional conduct of their members as they may consider proper, provided, however, that there shall be no infringement of the adopted ethical principles of the American Medical Association. The adoption of this revision resulted in the consolidation of the Medical Society of the State of New York and the New York State Medical Association under the name of the former and the plan of organization of the latter. The revision under its new title, the Principles of Medical Ethics, was submitted on May 10, 1906, by order of the supreme court of the State of New York to a referendum vote of the full membership of the consolidated society. By a vote of 3306 in the affirmative and 197 in the negative the Principles of Medical Ethics became binding on the Medical Society of the State of New York, and thus ended a division of the medical profession in the State of New York which continued 24 years—from 1882 to 1906. Consult Flint, *Medical Ethics and Etiquette* (New York, 1883), and *Principles of Medical Ethics*, issued by the American Medical Association (Chicago, 1912).

MEDICAL DEPARTMENT, UNITED STATES ARMY. The medical department is charged with the duty of investigating the sanitary condition of the army and making recommendations thereon; of advising with reference to the location of permanent camps and posts, the adoption of systems of water supply and purification, and the disposal of waste; with the duty of caring for the sick and wounded, making physical examinations of officers and enlisted men, the management and control of military hospitals, the recruitment, instruction, and control of the hospital corps and of the nurse corps (female), and furnishing all medical and hospital supplies except for public animals. In 1915 the authorized strength of the medical department, in time of peace, was 1 brigadier general, with the title of surgeon-general, 14 colonels, 24 lieutenant colonels, 105 majors, 205 captains, 254 first lieutenants (of whom 99 were first lieutenants of the medical reserve corps on active duty and 60 dental surgeons); total, 603 commissioned officers. The authorized enlisted strength (hospital corps) is 4012 men. Under an Act of Congress approved March 1, 1887, the enlisted men are not to be counted as a part of the strength of the army. In addition to the commissioned officers, civilian physicians and dentists may be employed as *contract* surgeons and *acting* dental surgeons under contracts entered into by or with the authority of the surgeon-general of the army. Of these there were 16 contract surgeons and 40 acting dental surgeons in 1915.

This department is also charged with the organization and training of the various units of the sanitary service required in the field in time of war. The functions of the sanitary service are as follows: (*a*) the institution of all practicable sanitary measures, to the end that the fighting forces suffer no depletion in strength due to avoidable causes; (*b*) the temporary care and professional treatment of the sick and wounded and their transportation to accessible points where they are transferred with as little delay as possible to the line of communications; (*c*) the supply of the necessary sanitary equipment. In addition, the sanitary service is charged with the preparation and preservation

of individual records of sickness and injury in order that claims may be adjudicated with justice to the government and the individual.

The *personnel* of the sanitary service in the zone of the advance may be classified into two general groups, as follows: first, that attached to organizations smaller than a brigade, which functions under the immediate orders of the organization commander and accompanies its unit into combat; second, that attached to the sanitary train, which functions under the orders of the division surgeon in accordance with such general or specific instructions as he may receive from the division commander. When necessary the sanitary *personnel* attached to organizations may be temporarily detached, in whole or part, and directed to operate with the sanitary train.

For the relief, care, and evacuation of the sick and wounded in battle the sanitary service provides, from front to rear, the following: (*a*) first-aid packets carried on the person; (*b*) regimental aid stations as near the firing line as possible; (*c*) dressing stations in the immediate rear of the regimental aid stations; (*d*) a station for the slightly wounded; (*e*) field hospitals, located 3 or 4 miles from the battle field, to which the wounded are carried by the ambulance companies; (*f*) evacuation hospitals still further to the rear. The services and equipment of the American National Red Cross Association are utilized under the immediate direction of medical officers. General hospitals, under the exclusive control of the surgeon-general of the army, are located as follows: Army and Navy General Hospital, Hot Springs, Ark.; General Hospital, Fort Bayard, N. Mex.; Letterman General Hospital, San Francisco; Walter Reed General Hospital, Washington, D. C.

The Army Medical School is located at Washington, D. C., and is organized under the supervision of a board of four or more instructors selected from officers of the medical department stationed in Washington and such assistant instructors as may be required. The senior officer, usually a colonel or lieutenant colonel, acts as commandant. Student officers are selected by the surgeon-general from medical officers, candidates for appointment, and militia officers. The course of instruction is for eight months and includes lectures and practical instruction in the duties of medical officers in war and peace; military medicine; microscopy, sanitary and clinical; military surgery, the care of the wounded in war, and hospital administration; pathology, histology, bacteriology, and urinology; hospital-corps drill; first aid to wounded; X-ray work; equitation. Consult: *United States Army Regulations* (Washington, 1913) and *Field Service Regulations* (ib., 1914). See CONTRACT SURGEON; SURGEON, MILITARY; HOSPITAL CORPS; HOSPITAL, *Military Hospitals*.

MEDICAL DEPARTMENT, UNITED STATES NAVY. This comprises the Bureau of Medicine and Surgery of the Navy Department and the officers, men, and affairs under its cognizance, including all matters pertaining to the health and hygiene of the *personnel* of the navy, naval hospitals, hospital ships, etc. The chief of the bureau is selected from among the senior officers of the medical corps; he has the title of surgeon-general of the navy and the rank of rear admiral. At or near each important naval station there is a naval hospital in charge of a medical director, medical inspector, or surgeon. There is also a hospital at the Naval Medical School (Washington, D. C.) and at Las Animas (Colo.). The chemical laboratory and naval-supply depot is at New York. The North Atlantic fleet is accompanied by a hospital ship commanded by a surgeon of the navy and in times of war there would be several such ships. On each vessel of the navy, except very small ones, there is at least one surgeon—on the larger ones two or three. The *personnel* of the medical department is made up of the medical corps, the medical reserve corps, the dental corps, the pharmacists, the nurse corps, and the enlisted men. In 1915 the medical corps consisted of 17 medical directors (rank of captain), 15 medical inspectors (rank of commander), 85 surgeons (rank of lieutenant commander), 154 passed assistant surgeons (rank of lieutenant), 41 assistant surgeons (rank of lieutenant, junior grade), 20 acting assistant surgeons (rank of lieutenant, junior grade), and 116 assistant surgeons (rank of lieutenant, junior grade) of the medical reserve corps. Candidates for the medical corps of the navy were formerly appointed directly to the medical corps from civil life. A candidate is now first given a preliminary examination for appointment as assistant surgeon in the medical reserve corps and, after taking the course at the naval medical school, comes up for final examination. Should he pass this he is appointed an assistant surgeon in the medical corps. A candidate for the position of assistant surgeon must be not less than 21 nor more than 30 years of age. The services of the medical reserve corps, which are entirely without pay, are rendered mainly in connection with recruiting stations and naval hospitals. A candidate for appointment in the reserve corps must be between 22 and 45 years of age and a citizen of the United States. He must be a graduate of a reputable medical school legally authorized to confer the degree of doctor of medicine and must have qualified to practice medicine in the State or Territory in which he resides. Appointment to this corps is made by the President upon the recommendation of the Secretary of the Navy after the candidate has passed the prescribed examinations. Permission to appear for examination must be obtained by application to the Bureau of Navigation through the surgeon-general. These examinations are conducted by officers of the medical corps of the navy.

The dental corps of the navy is under the cognizance of the Bureau of Medicine and Surgery. It consists of 1 dental surgeon, 28 acting assistant dental surgeons, and 11 assistant dental surgeons of the dental reserve corps; all have the rank of lieutenant, junior grade.

There are 14 chief pharmacists with the rank of ensign and 11 pharmacists with the rank of warrant officer. The nurse corps (female) is in charge of a superintendent. At each hospital there is a head nurse, or nurse in charge. Nurses serve only in hospitals and on hospital ships. On men-of-war the sick are nursed by hospital stewards and hospital apprentices. See UNITED STATES, *Navy*.

MEDICAL EDUCATION. The earliest institutions for the teaching of medicine were situated in temples and groves dedicated to the worship of the deities who were supposed to preside over the health of their worshipers. Thus, in Egypt the god Osiris and his wife Isis were the tutelary deities of the medical arts, and in Greece the god of health was Æsculapius.

The temples were situated in the neighborhood usually of streams and springs which were supposed to possess healing properties. One of the most famous of these ancient temples was that situated on the island of Cos; its most celebrated disciple was Hippocrates, who flourished early in the fourth century B.C. and whose teachings ruled medical science even to the close of the eighteenth century. Throughout Italy the same methods prevailed, the Romans deriving most of their medical lore from Greek teachers. Thus, Galen was a native of Pergamum, where there was a famous medical school in which he was educated. His great work as a teacher, however, was done in Rome. Greek teachers were also responsible for the rise of the Arabian school of medicine. In the sixth century A.D. the Nestorians, being driven out of Syria because of their heretical opinions, settled largely among the Arabs and transmitted to them their medical knowledge. By this time the teacher of medicine was practically divorced from his religious functions, although even down to the mediæval period much of the medical learning of the world appertained to the priesthood.

Until the time of the Renaissance the teaching of medicine in the mediæval medical schools consisted almost solely in dissertations and lectures upon the writings of Hippocrates and Galen. The dissection of the human body was only intermittently practiced. In 1315 Mondino dissected in Bologna the cadavers of two women. Master Albert, a lecturer in the same institution, dissected, in 1319, a body stolen from the cemetery by the students. Bertucci and Pietro de Angela, a little later, made systematic dissections. But, on the whole, anatomical science had made little advance.

Clinical teaching was on no better basis. The only way in which the student received bedside instruction was through apprenticing himself to some practitioner and accompanying him on his rounds, or by acting as his servant and assistant. Although the great universities conferred degrees in course, there were, nevertheless, enormous numbers of quacks and charlatans who flourished in the absence of any efficient laws regulating the right of persons to practice the healing art.

In the Middle Ages the most famous of all the medical schools was that of Salerno, near Naples, which was organized in connection with a monastery of Benedictine monks. Its graduates were to be found teaching in all quarters of the globe, and its influence was widespread, not only at the period in which it flourished, but for many years subsequent. Another celebrated medical school was that of Montpellier in France. The University of Paris was founded in 1205 and graduated very large classes. Its graduates were held in high esteem. They were not allowed to practice surgery, and held practitioners of that art in the greatest contempt. France, however, was the pioneer in recognizing the necessity for a higher education of surgeons and for their elevation to a rank corresponding to that of physicians. In surgical teaching the French were always greatly in advance of other nations. It was in the University of Paris, likewise, that midwifery was first taught to classes of male students.

Among the most famous centres for medical teaching in the sixteenth century were the schools of Bologna, Padua, and Pisa in Italy. At the present time Italian physicians are doing a large amount of scientific research work. The facilities offered to students in their medical colleges, however, are not to be compared with those accorded by the other continental medical schools. In Germany there were numbers of universities with flourishing medical departments at a very early period, among which may be mentioned Erfurt, Wittenberg, and Vienna. With the nineteenth century a new era dawned in German medicine. To it more than to any other single nation is due the credit of the wonderful achievements of the present-day medicine. Virchow, Koch, and the other distinguished occupants of professorial chairs have had in their classes and laboratories eager students from all over the world. A more general education and a larger acquaintance with the various branches of the natural sciences are required of the German medical student than is customary elsewhere; a term of five years is requisite to obtain the degree of M.D.

In England the teaching of medicine was established upon a scientific basis chiefly by the efforts of Thomas Linacre, who founded chairs for the teaching of medicine in the universities of Oxford and Cambridge. As physician to Henry VIII he possessed an extensive influence at court, and this he wielded to great advantage, inducing the King to take the power of licensing persons to practice medicine out of the hands of the bishops, and rendering it necessary for the candidates to pass an examination and receive a degree from one of the other of the two universities. In England, as in France, it was many years before the education of the surgeon was considered as of equal importance with that of the physician. Until 1745 the surgeons were associated with the barbers in the corporation of the barber surgeons. In that year they separated, although it was not until more than 50 years later that the Royal College of Surgeons was incorporated.

The medical profession in England consists of three classes: first, physicians, who have received their degree from one of the universities; second, surgeons, who have graduated from one or another of the schools which exist in connection with the hospitals; and third, apothecaries, who dispense their own drugs and are generally considered as family physicians. Dispensers like American apothecaries are in England called chemists. The large hospitals in London have, in many instances, medical schools connected with them. Of the more prominent may be mentioned St. Thomas's, St. Bartholomew, St. George's, and Guy's. The course of instruction at these hospitals is three years; the teachers are the physicians and surgeons who serve the hospitals. After passing the examinations at his medical school, in order to obtain authority to practice the graduate is obliged to pass an examination before a board composed of representatives of some of the leading medical societies, such as the Royal College of Physicians, the Royal College of Surgeons, or the Society of Apothecaries, or of some of the faculty of one of the universities.

The medical schools of Scotland are of great antiquity. That of St. Andrews was founded in 1411, and the University of Edinburgh dates back to the year 1582, although it was many years subsequent to this before medical teaching there was placed on a scientific basis. The latter university exerted an incalculable influence on medical teaching in the United States,

owing to the large number of American students who attended its courses.

From a very early period in the history of North America public lectures on medical topics were given in various parts of the country. To Dr. Cadwallader Colden is ascribed the credit of the first attempt to establish a systematic course on medicine in the Colonies. He tried to have the Assembly in the Province of Pennsylvania pass an act imposing a tax upon every unmarried man for the purpose of supporting a "public physical lecture in Philadelphia." His efforts were fruitless. In 1730 Dr. Thomas Cadwallader lectured on anatomy in Philadelphia, and in 1752 Dr. William Hunter, a cousin of the great John Hunter, lectured on anatomy at Newport, R. I. Dr. Charles F. Wiessenthal, of Baltimore, delivered lectures on surgery in that city prior to the Revolution.

The first medical school in the United States was founded by Drs. John Morgan and William Shippen, Jr., in 1765, when they established a medical department of the College of Philadelphia, which institution subsequently became the University of Pennsylvania. This was shortly followed by the organization, in 1767, of the medical department of King's College, New York, the lineal ancestor of Columbia University. Harvard University established its medical department in 1782, and in 1898 a medical department was established by Dr. Nathan Smith at Dartmouth College. Previous to the foundation of medical schools the education of physicians in America had been entirely by means of the apprenticeship system, except when a young man possessed sufficient means to go abroad and study in the medical schools of Edinburgh, London, or the Continent. It has been estimated that at the outset of the War for Independence there were upward of 3500 practitioners in the Colonies, of whom not more than 400 had received medical degrees. Most of the early teachers in American medical schools had been educated at the University of Edinburgh. This led to a close perpetuation of the traditions of the medical school of Edinburgh in the United States. In the early part of the nineteenth century it became customary for American physicians desirous of studying abroad to take their postgraduate work in France. In this way the teaching of Laennec, Trousseau, and above all of the great Louis, became familiar to the American profession and served to give an immense impetus to scientific medical work in the United States. The most prominent medical colleges of the United States now require candidates for admission to possess a collegiate degree. In 1914 34 medical schools required as a minimum for entrance two or more years of work in a college of liberal arts in addition to a four-year high-school education; and five require, in addition to a four-year high-school course, one year of college work in physics, chemistry, biology, and a modern language. See MEDICAL STATISTICS.

In almost every State of the Union there are now examining boards which hold periodical examinations, which it is necessary for a physician to pass before he can establish himself in practice in the State. In 1875 there were no medical schools in the United States which required even so much as a three years' course. In 1914 a four years' course leading to the degree of doctor of medicine was the standard required for admission to membership in the Association of American Medical Colleges.

In the last 10 years there has been a marked reduction in the number both of medical colleges and of students. Colleges were decreased from 165 to 101. The number of students fell from 28,142 to 16,502, the number of graduates from 5747 to 3594. This was in response to a movement for reform inaugurated by the American Medical Association. Since the Civil War the number of colleges, many of them of low standing, had multiplied so rapidly that by 1906 there were more medical schools in the United States than in all other countries of the world combined. In response to a widespread demand for reform many of the small colleges were induced to dissolve and many others merged with stronger and better-equipped institutions. Finally the council on medical education created a standard classification of schools into grades denominated A, B, and C, according to the severity of their entrance requirements, length of course, and the quality of teaching and equipment. There was also a marked tendency for independent medical colleges to affiliate with universities and to establish closer relations with hospitals. Three colleges require a fifth year to be spent by the student as a hospital interne before conferring the degree of doctor of medicine. Twenty-eight States now have medical schools as integral parts of the State university. Twenty of these give a complete medical training and confer the degree of doctor of medicine and eight give only the first two years of the medical course. In 15 States no other medical schools exist, this branch of education being entirely in charge of the State university. A similar arrangement went into effect in Alabama in 1915.

Medical Education of Women. The proposition to admit women into the medical profession met with bitter opposition, which has gradually given way. Although the Boston Homœopathic School for Women was opened as early as 1848, the Association for the Advancement of the Medical Education of Women, organized some time afterward, first brought the subject clearly to public attention. The Woman's Medical College at Philadelphia was opened in 1850, and graduated 18 students in 1914. The Woman's Medical College of the New York Infirmary was opened in 1868 by Dr. Elizabeth Blackwell and her sister Emily (qq.v.), the Infirmary for Women and Children having been in successful operation since its establishment by Dr. Blackwell in 1853. The college was closed in June, 1898, having fulfilled its mission. There is a homœopathic institution in New York. In 1914 there were only two medical colleges exclusively for women students, the necessity for the existence of such institutions having declined with the practice of accepting students of both sexes by most medical colleges. In this year there were over 54 coeducational schools. Altogether there were 496 matriculants and 121 graduates.

Medical schools for women have been founded by American women in Turkey, and 15 graduates of the Woman's Medical College of Philadelphia in 1884 were especially prepared for missionary work in foreign lands. One of the first female practitioners in England was Dr. Elizabeth Blackwell, who settled in London in 1868 and became connected with the Woman's Medical College there. As late as 1867 the Apothecaries' Society passed resolutions excluding women from examinations for degrees. The admission of women to the University of Edinburgh led to

open riots among the students. The "enabling bill," giving permission to medical schools and societies to grant qualifications for the registration of physicians without regard to sex, was passed by Parliament in 1876; King's and Queen's College of Physicians, Dublin, and the London University threw open their doors to women soon afterward; and a preparatory medical school in London annually recruits the number of female matriculates in these institutions. There are dispensaries at London, Leeds, and Bristol superintended by female physicians; and Queen Victoria during her reign interested herself in behalf of medical missions carried on by Englishwomen in the East. The faculty of medicine at Paris has given a number of diplomas to women, as have the universities of Bern, Zurich, and Geneva. The first woman medical graduate in Germany was Mrs. Dorothea Christiana Erxleben, who received the medical degree from the University of Halle in 1754, upon recommendation by Frederick the Great in a royal decree. But medical colleges in Germany were closed to women till 1900, when by a decision of the German Federal Council female medical students were entitled to be admitted to the state examinations in medicine. Heidelberg University opened its doors to women in 1900. There are medical courses for women at the Carolinian institutions at Stockholm and at Upsala. The Spanish universities of Madrid, Valladolid, and Barcelona extend the same privileges. The War Department of the Russian government founded a medical school for women at St. Petersburg; a similar institution is now open at Moscow. All the medical societies in the United States and many in foreign countries admit female physicians to their congresses and discussions. For a complete presentation of medical education, consult "Medical Colleges of the United States" in the *Journal of the American Medical Association* (Chicago, 1914). See MEDICAL STATISTICS.

MEDICAL ELECTRICITY. See ELECTRICITY, MEDICAL USES OF.

MEDICAL INSPECTION OF SCHOOLS. See SCHOOLS, MEDICAL INSPECTION OF.

MEDICAL JURISPRUDENCE, or FORENSIC MEDICINE. The application of medical science to the elucidation of legal questions which have a medical aspect. Although the principles of medical jurisprudence engaged the attention of the earliest lawmakers, Germany is given the credit of first providing by law for the examination of medical witnesses. This law was enacted in 1532 during the reign of Charles V and provided that in every case where death had been brought about by violence the opinion of physicians should be sought. It was not until the nineteenth century that forensic medicine developed any importance. In 1867 the Medico-Legal Society of the city and State of New York, the first of its kind, was organized. At the present time there are many such societies both in America and Europe. The questions included in modern medical jurisprudence are divided by Godkin into five general classes: (1) those arising out of sex relations, as impotence and sterility, pregnancy, legitimacy, and rape; (2) injuries inflicted on the living organism, as infanticide, wounds, poisons, injuries, and death from violence; (3) questions arising out of disqualifying diseases, as the different forms of mental alienation; (4) those arising out of deceptive practices, as feigned diseases; (5) questions of a miscellaneous nature, as age, identity, presumption of seniority, and life assurance. Writers on medical evidence hold that all testimony of a medical witness is expert evidence, but it admits of classification into (1) ocular evidence, which embraces such facts as may be observed in the ordinary attendance upon a patient, and (2) expert evidence, which includes evidence bearing on such cases as those in which a practitioner is required to give testimony based on a hypothetical statement propounded at a trial, or where he is called upon to testify as to the mental or physical condition of an individual examined by him for this special purpose.

In criminal trials in the United States each side hires its own experts, and, owing to the use of hypothetical questions and the advocate's eliciting only part of the truth, the spectacle is often presented of equally competent medical experts flatly contradicting each other. The effect which this has had in casting doubt upon the value of expert opinion, and the dissatisfaction to which it has given rise in the minds of judges, juries, and experts themselves, have led to numerous plans for remedying this defect in the present system of calling expert witnesses by establishing a class of official experts; but most of these plans conflict with one or all of the fundamental principles of the common law relating to the conduct of criminal trials: that the court shall be the sole judge of the law, that the jury shall pass upon facts, and that the defendant shall have the right to present any proper evidence on his own behalf.

In France experts are generally selected from a list of official specialists, termed *experts assermentés*, and if the parties cannot agree upon the experts, the court appoints them. The court may order an investigation and report by experts whenever necessary, and the order contains a statement as to the exact object of the investigation and appoints a referee or *juge commissaire*. Barristers, or *avocats*, do not appear before the experts; but the parties are represented by solicitors, or *avoués*, or sometimes by persons specially skilled in the matter under investigation. The report must be signed by all the experts (who are three in number), the reasons for any dissenting opinion being embodied in the report. The judges, however, are not bound by the report if it is contrary to their convictions.

In Germany official experts are scientifically trained in medicine, surgery, and obstetrics, and must pass an examination in their specialties of medical jurisprudence before the supreme board of the state. Every district has its expert governmental physician or surgeon. A medical college is selected in each province, to which appeal may be made when experts differ, and there is a final appellate court for the whole state to which further appeal may be made. Professional experts are paid by the government, are dependent upon neither side for compensation, and are given the preference in trials where their special knowledge is required; but the calling of outside experts is not thereby precluded. After the issues are determined upon which expert testimony is sought the parties may agree upon the experts and the court may appoint them. The court may limit the number of experts, or may submit to the parties the names of a number of experts, permit each side to challenge a certain number, and appoint those remaining.

The plan suggested by Sir James Stephen in his *History of the Criminal Law of England*, and used for some years in Leeds, has given much satisfaction. Under this plan, which requires a high standard of professional honor and knowledge, medical men refuse to testify unless before doing so they can meet in conference with the experts of the opposing side and have an exchange of views. As a result it is stated that at Leeds medical witnesses are rarely cross-examined, and often they are called on one side only.

Consult: *Medical Serials, with Bibliography of Medical Jurisprudence*, published by the New York State Library (2d ed., Albany, 1910); J. J. Reese, *Textbook of Medical Jurisprudence and Toxicology* (8th ed., Philadelphia, 1911); Robertson, *Manual of Medical Jurisprudence, Toxicology, and Public Health* (2d ed., London, 1913); Brothers, *A Statement of the Law of Forensic Medicine* (St. Louis, 1914). See EVIDENCE; BLOODSTAINS; HOMICIDE; INFANTICIDE; INSANITY.

MEDICAL SCHOOL. See MEDICAL EDUCATION.

MEDICAL SCHOOL, NETLEY. An establishment at Netley, near Southampton, England, for the technical education of medical officers for the British and Indian military service. Candidates are examined competitively in the ordinary subjects of professional knowledge, and, passing satisfactorily through that ordeal, are then required to attend for six months at the Military Medical School, where they go through practical courses of military hygiene, military and clinical-military surgery and medicine, and pathology with morbid anatomy. There is a training school for army nurses in connection with the hospital at Netley, where women enlist for life or during competency for work in army hospitals, in the field, or in foreign lands in care of the sick soldiery.

MEDICAL STATISTICS OF THE UNITED STATES. In the United States of America, including the Philippine Islands, Porto Rico, Hawaii, Alaska, and the Canal Zone, there were, in 1914, 138,443 physicians. The population of the United States alone was approximately 100,000,000. The United States has one physician to every 600 to 650 people, while the normal proportion of physicians to population in the leading nations of Europe is one to every 1500 to 2500 people. The figures given for the United States do not include the osteopaths, Christian Scientists, and other so-called drugless practitioners scarcely found in other countries. In 1914 there were 101 medical colleges and schools in the United States, with 16,502 students and 7411 instructors. Of the 101 schools 87 are regular or nonsectarian, 10 are homœopathic, 4 are eclectic; 54 are coeducational and 2 are colleges solely for women. There were also 17 postgraduate medical schools. The graduates in 1914 numbered 3320 nonsectarian, 154 homœopathic, and 70 eclectic, in all 3594. The status of medical colleges and schools in the United States is determined by the rating accorded them in the third classification of the Council on Medical Education of the American Medical Association. Statistics published in 1914 show a decrease during the last decade of about 35 per cent in the number of medical colleges and corresponding reductions in the number of students and graduates. See MEDICAL EDUCATION.

MEDICI, mā'dē-chē, THE. The most celebrated family of the Florentine Republic. The Medici owed their earliest distinction to the success with which they had pursued various branches of commerce and the liberal spirit in which they devoted their wealth to purposes of general utility. From the thirteenth century the Medici took part in all the leading events of the Republic. From the time when Salvestro de' Medici attained the rank of *gonfaloniere* in 1378 the family rose rapidly to preëminence, the foundation of its greatness being especially due to Giovanni, who died in 1429, leaving to his sons, Cosimo and Lorenzo, a heritage of wealth and honors hitherto unparalleled in the Republic. With Cosimo (1389–1464), on whom was gratefully bestowed the title of "Father of his Country," began the glorious epoch of the Medici; while from Lorenzo was descended the collateral branch of the family, which in the sixteenth century obtained absolute sway over Tuscany. Cosimo's life, except during a short period, when the Albizzi and other families reëstablished a successful opposition against the policy and credit of the Medici, was one uninterrupted course of prosperity. At once a munificent patron and a successful cultivator of art and literature, he did more than any sovereign in Europe to revive the study of the ancient classics and to foster a taste for mental culture. He assembled about him learned men of every nation and gave liberal support to numerous Greek scholars, and by his foundation of an academy for the study of the philosophy of Plato, and of a library of Greek, Latin, and Oriental manuscripts, he inaugurated a new era in modern learning and art. But, though he retained the forms of the Republic, and nominally confided the executive authority to a *gonfaloniere* and eight *priori*, or senators, he totally extinguished the freedom of Florence.

His grandson, LORENZO THE MAGNIFICENT (1449–92), became the virtual head of the Florentine state in 1469. In 1478 the conspiracy of the Pazzi nearly succeeded in overthrowing the Medici. Lorenzo's brother Giuliano was slain and he himself barely escaped. The result of the conspiracy was to give Lorenzo a firmer hold upon the state. He pursued with signal success the policy of his family, which was to win the favor of the lower classes and thereby make absolute their own power. He encouraged literature and the arts, employed learned men to collect choice books and antiquities for him from every part of the known world, established printing presses in his dominions, founded academies for the study of classical learning, and filled his gardens with collections of the remains of ancient art. When, however, his munificence and conciliatory manners had gained for him the affection of the higher and the devotion of the lower classes, he lost no time in breaking down the forms of constitutional independence that he and his predecessors had hitherto suffered to exist. Some few Florentines, alarmed at the progress of the voluptuous refinement, which was smothering every spark of personal independence, tried to stem the current of corruption by an ascetic severity of morals, which gained for them the name of *piagnoni*, or weepers. Foremost among them was the Dominican friar Girolamo Savonarola (q.v.), whose eloquent appeals to the people in favor of a popular and democratic form of government and a life of asceticism threatened for a time the overthrow of the Medici. Lorenzo achieved some reputa-

tion in belles-lettres. We have from him poems of many kinds, lyric, moral, dramatic, and descriptive. His *Canzoni* and *Sonetti* are love poems, to which he added a prose commentary. A true feeling for nature appears in the *Caccia del falcone*, and a rather pleasing picture of rural life is to be found in his *Nencia da Barberino*. A dramatic composition of a kind held in favor at the time is the *Rappresentazione di Santi Giovanni e Paolo* (performed in 1489). Like so many writers of the period, he cultivated the form of the *ballata* or dance song. He wrote also a number of *canti carnascialeschi*, or carnival songs. The religious spirit prevails in his *Laudi spirituali*. His love poetry is the best of all that he produced, and the most distinctive characteristic in it is the note of melancholy.

PIETRO (born in 1471), who succeeded his father Lorenzo in 1492, possessed neither capacity nor prudence; and in the troubles which the ambition of her princes and the undue use of the temporal power of the popes brought upon Italy, by plunging her into civil and foreign war, he showed himself treacherous and vacillating, alike to friends and foes. When Charles VIII of France, in 1494, marched into Italy in order to achieve the conquest of Naples, Pietro, in hopes of conciliating the powerful invader, hastended to meet the troops on their entrance into the dominions of Florence, and surrendered to Charles the fortresses of Leghorn and Pisa, which constituted the keys of the Republic. The magistrates and people, incensed at his perfidy, drove him from Florence and formally deposed the family of Medici from all participation in power. Pietro lost his life in the battle of the Garigliano in 1503 while fighting in the French ranks. In 1512 the Medici were reinstated in Florence, and the elevation of Giovanni de' Medici to the papal chair, under the title of Leo X (1513–21), completed the restoration of the family to their former splendor. The accession of Giulio de' Medici to the pontificate as Clement VII (1523–34), the marriage of Catharine, the granddaughter of Pietro, to Henry II of France in 1533, and the military power of the cadet branch (descended from a younger brother of the "Father of his Country") widened the rôle which the Medici were enabled to play.

Expelled from Florence in 1527, they were reinstated, and this time permanently, in 1530, by the combined forces of the Emperor Charles V and Pope Clement VII. The Florentines were forced to accept as their ruler a worthless prince, Alessandro de' Medici, a natural son of Lorenzo II (the father of Catharine), who was invested with the ducal dignity. On his death by assassination without direct heirs, in 1537, Cosimo I, the descendant of a collateral branch, was raised to the ducal chair. Cosimo, known as the Great, possessed the astuteness of character, the love of elegance, and taste for literature that had distinguished his great ancestors; but none of their frank and generous spirit. He founded the academies of painting and of fine arts, made collections of paintings and statuary, published magnificent editions of his own works and those of others, and encouraged trade, for the protection of which he instituted the ecclesiastical Order of St. Stephen. He was implacable in his enmity and did not scruple to extirpate utterly the race of the Strozzi (q.v.), the hereditary foes of his house. His acquisition of Siena gained for him in 1569 the title of Grand Duke of Tuscany from Pius V. He died in 1574, leaving enormous wealth and regal power to his descendants, who, throughout the next half century, maintained the literary and artistic fame of their family. In the seventeenth century the race rapidly degenerated, and after several of its representatives had suffered themselves to be made the tools of Spanish and Austrian ambition, the dynasty of the Medici became extinct with Giovanni Gastone, who died in 1737. In accordance with the stipulation of the Peace of Vienna, the Grand Duchy of Tuscany passed to the house of Lorraine. The name of the Medici family was kept alive by a house which pretended to have emanated from it in the thirteenth century, and which acquired the Principality of Ottojano towards the end of the sixteenth century. To this house belonged Luigi de' Medici (1760–1830), Duke of Sarto, known as the Chevalier de' Medici. He was a minister of Ferdinand I and Francis I of the Two Sicilies, and died while visiting Madrid in 1830.

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MEDICI, TOMBS OF THE. The burial place of the Medici family in the new sacristy of the church of San Lorenzo at Florence. It contains Michelangelo's statues of Giuliano and Lorenzo de' Medici, the former represented as a general of the Church, the latter in deep meditation. The sarcophagus of Giuliano is adorned by the famous sculptures of Day and Night, and that of Lorenzo by those of Evening and Dawn. The work was left unfinished in 1534.

MEDICI, VILLA. See VILLA MEDICI.

MEDICINA, mā'dē-chē'nȧ. A town in the Province of Bologna, Italy, 15 miles east of the city of Bologna. It is situated in a low-lying region which is extensively cultivated. It has some manufactures, and trades in grain, wine, and mineral waters. Pop. (commune), 1901, 12,535; 1911, 13,632.

MEDICINAL (mĕ-dĭs'ĭ-nȧl) **PLANTS.** Plants of which some part or product is used in medicine. Consult White, *Materia Medica* (London, 1914).

MED'ICINE (OF. *medicine*, Fr. *médecine*, from Lat. *medicina*, medicine, from *medicinus*, relating to a physician, from *medicus*, physician, from *medere*, Av. *mad*, to heal), HISTORY OF. While medical practice, in an elementary form, is probably as old as man, the oldest records of medical matters extant are those of Egypt. Most of our knowledge of Egyptian medicine is

derived from the Greeks, but recent discoveries of ancient papyri and better methods of deciphering inscriptions have yielded much original information. The Papyrus Ebers dates from about the sixteenth century B.C., and much of the learning therein recorded had been traditional for centuries. Certain facts concerning Egyptian medicine are well established. This art, as most others, was vested in the priests; there was an extensive formulary, combined with many ceremonial rites; practice was widely specialized—there were physicians, gynæcologists, veterinarians, and military surgeons; but there was nothing like progress from one age to another. Egyptian medical lore was preserved in the last six volumes of the Sacred Book. These treated of anatomy, general diseases, instruments, remedies, diseases of the eye, and diseases of women, and in completeness and arrangement rival the Hippocratic collection, which they antedate by a thousand years.

The Hebrews derived their medical knowledge from Egypt, and are chiefly remarkable for their thorough conception of the value of public hygiene and sanitation, of which systems they may be considered the originators. In the early days of the existence of the Hebrew nation disease was looked upon as a punishment for sin, and the Levites were the sole practitioners. Later in their history the Jews received the impress of Assyrian, and later still of Greek, thought. After two captivities we find a class of temple physicians and special surgeons, and in the centuries immediately preceding the Christian era there were communal or city physicians who were held in high esteem. Jewish medical records embraced in the Talmud (q.v.) show the Jewish physicians had, like the Egyptian, little knowledge of human anatomy, that their surgery was crude, and that no operations in midwifery were performed.

The Vedas (q.v.), the sacred books of India, show that medicine as a separate science was in that country very ancient. The Indian physicians combined a close observation of pathological phenomena with a genius for misinterpretation, so that their study availed them little. Demonology played a large part in their practice and belief. Physicians were drawn from the highest caste (the Brahmans), and long training, decorum, and piety were required of them. Their therapeutic methods embraced diet, bathing, and innumerable drugs.

The origin of Chinese medicine is lost in tradition and fable. The Chinese attributed the invention of medicine to the Emperor Hwang-ti, who was supposed to have lived about 2687 B.C. They had elaborate rules for noting the pulse, and a portentous array of curious remedies, drawn from the animal, vegetable, and mineral kingdoms. They knew no anatomy, and their surgery was of a barbarous type. No bloody operations were performed, but cupping, acupuncture (q.v.), plasters, and fomentations were used. Medical practice was entirely unregulated. Chinese medicine remained practically unchanged until recent years, when the medical missionaries introduced modern methods.

It is Greece that furnishes us with the most interesting and significant remains of the history of medicine during antiquity. Chiron (q.v.), the Centaur, is fabled to have introduced the art of healing into Greece and to have been the preceptor of Æsculapius (q.v.), who was as eminent among the Greeks as was Hermes in Egypt. Some scholars consider them identical. The followers of Æsculapius early formed a separate cult or worship. They had temples situated in groves and near springs, where healing was practiced and instruction given. Treatment consisted of the interpretation of dreams, propitiatory sacrifices, the offering of votive tablets, etc., but dieting, pure air, temperate living, and bathing also had their part in the cure, together with frictions, emetics, and purgatives. The system finally degenerated into mere mysticism, and by the time of Hippocrates only the superstitious resorted to it. Besides the temple medicine there were gymnasia, older even than Æsculapius, each of which had its *gymnasiarch* or director; a *gymnast*, under him, who directed the treatment of the sick; and *iatroliptes*, who anointed, gave massage, bled, and dressed wounds and ulcers.

The period prior to the dispersion of the followers of Pythagoras (q.v.) (c.500 B.C.) is sometimes called the *sacred period* of medicine. It was followed by the *philosophical period*, inseparably linked with the name of Hippocrates (q.v.) (460–c.357 B.C.), the first great apostle of rational medicine. He classified diseases into epidemic, endemic, and sporadic; he wrote extensively on surgery (though ignorant of dissection), on obstetrics, hygiene, regimen, and on climatic influences; and his works display an immense range of knowledge and high powers of description.

From the time of Hippocrates, for several centuries, we find medical beliefs crystallizing about several schools or systems. The *Dogmatic*, or rationalistic, school of Hippocrates, founded by his sons, Thessalus and Draco, and his son-in-law, Polybius, based its principles of practice on theories derived from known facts and observations, and regarded maladies as units from their beginning to their termination; i.e., they recognized diseases as distinct entities. The *Empirics*, on the other hand, taught that remedies could only be suggested by experience. Their school was founded, according to Celsus, by Serapion, a pupil of Herophilus, mentioned later in this article. The *Methodists* occupied a position somewhere between the Empirics and Dogmatists, and the *Eclectics* chose, or pretended to choose, from each system what suited them, and adhered to none.

The philosophic period ended and the *anatomic period* began with the foundation of the Alexandrian Library, after the death of Alexander the Great, by Ptolemy, one of his lieutenants. This was in 320 B.C., and the centre of medical thought and teaching was now shifted to Alexandria. Here the Ptolemies gathered about them the learned men of the day. Although Egyptian prejudice was strong against it, Ptolemy encouraged dissection of the human body. Among the famous teachers of Alexandria were Herophilus and Erasistratus (q.v.). The former is supposed to have been the first to dissect a human body, and between them they made many notable discoveries, concerning the structure of the brain, eye, heart, and intestinal canal. Erasistratus died about 280 B.C. During this period medical thought was practically divided into two schools, the Dogmatist and Empiric.

The first native Roman writer on medicine was Celsus (q.v.), born at about the time of Christ. His work, *De Medicina*, gives a sketch of the history of medicine up to his time and

the state in which it then existed. He followed the teachings of Hippocrates and exercised a dominant influence until Galen (q.v.) (130–c.201) totally supplanted him. Galen wrote over 100 works, some of them on anatomy. He described every bone in the human body, and the functions of the muscles; he recognized two kinds of nerves—those of sensation, which he thought came from the brain, and those of motion, which he believed to originate in the spinal marrow. He divided the body into the cranial, thoracic, and abdominal cavities, whose proper envelopes he described. Galen strove to popularize the study of anatomy, with but little success, and with his death came the end of the anatomical period and the end for several centuries of medical progress.

The first names of any renown that occur after the death of Galen are those of Oribasius, Alexander of Tralles, Ætius, and Paulus Ægineta, who flourished between the fourth and seventh centuries. They were all zealous Galenists. With the death of Paulus the Greek school may be said to have ended, for after his time no works of merit were written in this language.

Arabian medicine was an offspring of the Greek, through the Nestorian monks, who settled in Persia and Arabia in the sixth century and established many schools of learning. Fragments of the sect still remain in these countries. By the seventh century Arabian physicians were in high repute. The earliest Arabic writer on medicine was Ahrum, who was contemporary with Paulus; but the most celebrated physicians of this school were Rhazes, who lived in the ninth century and was the first to describe smallpox; Avicenna (q.v.), of the eleventh century, whose *Canon Medicinæ* embraced all that was then known of medicine and the collateral sciences; Albucasis, whose works on surgery were the standard for several centuries; Avenzoar; and Averroës, who lived in the twelfth century and was equally celebrated as a physician and a philosopher. The works of Hippocrates and Galen, which, together with those of Aristotle, Plato, and Euclid, were translated into Arabic in the ninth century, formed the basis of their medical knowledge; but the Arabian physicians did good service to medicine by introducing new articles from the East into the European materia medica, e.g., rhubarb, cassia, senna, and camphor, and in making known the first elements of pharmaceutical chemistry, such as distillation and the methods of obtaining various metallic oxides and salts. During this period that part of Europe not in the hands of the Saracens was subjected to successive invasions of northern barbarians, and medicine, as other arts, was at a standstill. There was a brief period of quiet during the reign of Charlemagne, when medical practice seems to have again passed into ecclesiastical control, and from the ninth until the thirteenth century the Jews (who acquired their learning from the Saracens) shared with the clergy the art of healing.

Upon the decline of the Saracenic universities of Spain, which may be dated from the death of Averroës, the best medical teaching was to be found in Italy, where the school of Salerno became celebrated. It was gradually eclipsed in its turn by the rising fame of other medical schools at Bologna, Vienna, Paris, Padua, and elsewhere. Contemporary with Mondino lived Gilbert, the first English medical writer of note; and the prior century gave birth of Linacre (q.v.), who studied at the continental universities and subsequently founded the London College of Physicians. It was in the fifteenth century that the sect of chemical physicians arose, who maintained that all the phenomena of the living body may be explained by the same chemical laws as those which rule inorganic matter. The chemical school, with Paracelsus (q.v.) at their head, did nothing to advance medicine except to introduce into the materia medica several valuable metallic preparations. During this period many new diseases were recognized and described.

In the sixteenth century the study of human anatomy was first fairly established by the labors of Vesalius (q.v.), and in this century and the following we meet with the names of many physicians whose anatomical and physiological studies materially advanced medical science. This was the epoch of Eustachio (q.v.), Fallopio (q.v.), Assellius, Harvey (q.v.), Rudbeck, Bartholin, Glisson, Sylvius, Willis, Bellini, and others. Ambroise Paré (1517–90) made important additions to surgical knowledge and technique. The Cæsarian operation, which had been known among the Greeks and Romans, was revived. Malpighi (q.v.) and Grew founded the cell doctrine. Besides many discoveries in minute anatomy, made possible by the invention and gradual improvement of the microscope, the materia medica was enriched by the addition of Peruvian bark, or cinchona, by the Countess Chinchon in 1632. The seventeenth century is also marked by great advance in obstetrics; medical jurisprudence had its beginning about this time; and bedside or clinical teaching was introduced. Chemistry was now becoming distinct from alchemy and advancing to the dignity of a science, and an alliance between its principles and those of physiology was formed, which resulted in a new sect of chemical physicians, quite distinct, however, from the sect represented two centuries previously by Paracelsus. These chemical physicians believed that diseases were referable to certain fermentations which took place in the blood, and that certain of these *humors* were naturally acid and others alkaline, and that when one or the other of these predominated certain specific diseases were the result, which were to be removed by the exhibition of remedies of a nature opposite to that of the disease. They were soon succeeded by the Iatromathematical school, of which Borelli, Sauvages, Kneill, Jurin, Mead, and Friend were among the best known. Another sect was that of the Vitalists, which originated with Van Helmont, and which, with some modification, was adopted by Stahl and Hoffmann. Among other physicians whose names stand out prominently in the annals of the seventeenth century are Sir Thomas Browne and Sydenham (q.v.), both Englishmen, the latter the greatest clinical physician of his time; Wharton, who discovered the submaxillary duct; Schneider, who described the Schneiderian mucous membrane of the nose; Stenson, Peyer, Brunner, Pacchioni, Havers, and Cowper.

The most eminent teacher of medicine in the early part of the eighteenth century was Boerhaave (q.v.), elected to the chair of medicine at Leyden in 1709. Among the pupils of Boerhaave was Van Swieten, whose comments on the aphorisms of his master formed a valuable collection of practical observations; and Haller (q.v.),

who has been called the father of modern physiology and who first enunciated the theory that irritability and sensibility are specific properties of muscular and nervous tissues. Most of the distinguished physicians of the latter part of the eighteenth century belonged to the Cullenian school of medicine. (See CULLEN.) Cullen's views were attacked with great acrimony by his former assistant, John Brown (q.v.), who became the founder of the Brunonian system of medicine. In Great Britain the views of Brown were regarded as too purely theoretical and did not attain any great popularity; but in some parts of the Continent, and especially in Italy, they found acceptance and became for a considerable time the prevailing doctrine in the leading medical schools. Among the medical curiosities of the later years of this century were the doctrine of animal magnetism, or mesmerism (q.v.), and homœopathy (q.v.). The latter was founded by Hahnemann (q.v.) and served a useful purpose in protesting against the enormous dosage of medicines and the excessive bloodletting then in vogue. The eighteenth century witnessed a steady progress in all branches of medicine and surgery, the social status of the practitioner was raised, and medicine became a conscientious vocation and not a mere trade. The greatest single discovery of the age, and that which conferred the most benefit on mankind, was vaccination (see JENNER), and next to this, perhaps, a reform in the methods of treating the insane. To supplement this outline of the progress of medicine in the eighteenth century, the reader is recommended to consult the biographical sketches of Monro, the Hunters, and others.

The nineteenth century was one of epoch-making discoveries, only a few of which can even be mentioned within the limits of this article. In the early years of the century Laennec (q.v.) invented the stethoscope and thereby instituted a complete revolution in the methods of physical diagnosis; Virchow (q.v.) founded modern cellular pathology; Pasteur (q.v.), by his studies in fermentation and putrefaction, prepared the way for the germ theory of disease; and Lister (q.v.), stimulated by Pasteur's discoveries, gave to surgery the antiseptic treatment of wounds. Laveran (q.v.) in 1880 discovered the plasmodium of malaria (q.v.), and Koch (q.v.) in 1882 the bacillus of tuberculosis. Since then it has been proved that anthrax, Asiatic cholera, and most of what are called the specific infectious diseases, are due to minute vegetable or animal organisms. (See BACTERIA.) The discovery of general anæsthetics was no less important and remarkable. Morton (q.v.), of Boston, demonstrated the anæsthetic properties of sulphuric ether in 1846; and Simpson, of Edinburgh, introduced chloroform in 1847. The introduction of cocaine as a local anæsthetic in 1884 by Koller made possible the performance of painless operations on the eye and in the nose and throat and other parts of the body. The materia medica has been enriched by the addition of quinine, morphia, strychnine, iodine and the iodides, the bromides, hydrocyanic acid, and cod-liver oil, and, more interesting than these, of antitoxic serums. (See ANTITOXIN; SERUM THERAPY.) Diphtheria antitoxin especially has saved thousands of lives. Among the more important instruments invented during the nineteenth century are the ophthalmoscope and the laryngoscope.

The early years of the twentieth century may be looked upon as the beginning of a new era, that of organized preventive medicine. Nearly all efforts have been in the direction of prophylaxis and control of disease. Tropical medicine in particular has been the subject of intense and organized study in Africa, America, and the East. Hookworm disease was brought under control in Porto Rico (1903–04) by Ashford, an American army surgeon, and in the southern United States by Stiles (1910–12), who named the American species *Necator americanus* (1912). In 1910 Loos demonstrated that the hookworm larvæ penetrate the skin. To the studies of Reed, Carroll, and Lazear must be credited the control of yellow fever. These observers proved the transmission of the virus of the disease by a mosquito, *Stegomyia*, and thereby enabled Gorgas to clear Havana of yellow fever in three months and afterward to accomplish the brilliant feat of sanitation which made possible the building of the Panama Canal. The control of tropical dysentery, sleeping sickness, beriberi, and other fatal tropical diseases has been measurably successful and life for the white man in the tropics has been rendered comparatively safe. Through the labors of Metchnikoff, Wright, and others the defensive properties of the blood and the subject of immunity in general have been enormously advanced and have resulted in the production of a new system of treatment of bacterial infection, viz., vaccinotherapy. Among the many new drugs discovered the most important is salvarsan (q.v.), a specific for syphilis introduced by Ehrlich in 1909. Schaudinn discovered the parasite in 1905, Wassermann the serodiagnosis in 1907, and Noguchi the luetin test for the disease in 1901. In 1913 Noguchi demonstrated the spirochetes in the tissue of the nervous system and thus cleared up many speculations as to the relation of syphilis to certain nervous diseases. These discoveries with respect to syphilis have put the diagnosis and treatment of this malady and its allied affections on an entirely new basis. The Roentgen rays (X rays) have found increasing employment both in treatment and diagnosis. Lastly this period has been marked by investigations of the internal secretions and the functions of ductless glands, which have been of valuable help in the elucidation of obscure diseased conditions. Other advances in contemporary medicine will be dealt with more fully under their own titles. Surgical developments, which have been great, will be noticed in full under the title SURGERY. For a complete review of medical progress year by year, consult the NEW INTERNATIONAL YEAR BOOK. See HYGIENE.

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MEDICINE, AMERICAN ACADEMY OF. An association organized in 1876 and incorporated in 1913, holding annual meetings in different large cities of the United States. It was organized to conduct an active propaganda for

the proper education of physicians and gradually developed into a society studying the questions of social medicine. It has a membership of nearly 700 and its publication is the *Journal of Sociologic Medicine*, appearing in Easton, Pa.

MEDICINE, Forensic. See Medical Jurisprudence.

MEDICINE, New or Eclectic School of. See Eclectic School of Medicine.

MEDICINE, Veterinary. See Veterinary Medicine.

MEDICINE DANCE. A name sometimes applied to the sun dance of the Cheyenne and other Plains Indians. The same ceremony among the Blackfoot Indians is spoken of as the medicine lodge. See Sun Dance; Cheyenne.

MEDICINE HAT. A city and the capital of the electoral division of Medicine Hat, Alberta, Canada, situated on the South Saskatchewan River and on the main line of the Canadian Pacific Railway, about 165 miles east-southeast (direct) of Calgary and about 600 miles west (direct) of Winnipeg (Map: Alberta, K 8). Its public buildings and institutions include the Dominion Lands Office, a general hospital, a business college, and the exhibition buildings and grounds. There are two parks and a dry-farming demonstration farm. Among manufacturing industries and establishments are a grain elevator, flour, linseed-oil, rolling and planing mills, brick plants, a steel plant, and manufactories of cement, graphite and crayon products, lumber, glass, clay products, and foundry and machine-shop products. Clay and coal are found in the surrounding district. The city owns its electric-lighting and gravitation water systems and eight natural-gas wells, which supply power for manufacturing. Pop., 1901, 1570; 1911, 5608.

MEDICINE MAN. A name used for a shaman among the American Indians. The term "medicine" in the same connection has no reference to the treatment of disease, but to supernatural relations between persons and objects, or between persons and higher powers. A true medicine man is in reality a priest rather than a doctor, though he may exercise both functions, since most medical practice among the Indians is based upon magic rather than upon therapy. See Indians.

MED'ICK (OF. *medique*, from Lat. *medica*, from Gk. *μηδική*, *mēdikē*, median grass, from *Μηδικός*, *Mēdikos*, median, from *Μῆδος*, *Mēdos*, OPers. *Māda*, Mede), *Medicago*. A genus of plants, natives of temperate and warm climates of the Old World, of the family Leguminosæ, distinguished from the closely related genus *Trifolium* (clover) by the sickle-shaped or spirally twisted pods. The species, which are very numerous, are mostly annual and perennial herbs with leaves of three leaflets like those of clover. A number of them are found in Europe, and have also been introduced into the United States. The most important species is the purple medick, lucerne, or alfalfa (q.v.); other important species are bur clover (*Medicago denticulata*), distributed in California and the grazing regions of the South and Southwest; yellow lucerne (*Medicago falcata*), which grows wild in northern Europe; black medick (*Medicago lupulina*), widely grown as a pasture plant; and spotted medick (*Medicago maculata*), introduced into the Eastern and Southern States. They are generally valuable as forage and pasture plants. Consult *Texas Agricultural Experiment Station, Bulletin 108* (College Station, Brazas Co., 1908), and *Alabama Agricultural Experiment Station, Bulletin 165* (Opelika, 1912).

MÉDICO DE SU HONRA, mā'dē-kō dā sōō ōn'rä, El (Sp., The Physician of his own Honor). One of the strongest dramas of Calderón.

MEDICO-PSYCHOLOGICAL ASSOCIATION OF GREAT BRITAIN AND IRELAND, The. An association founded in 1841, with headquarters in London, England, and incorporated in 1895. Its objects are the study and promotion of mental pathology and the improvement of the treatment of the insane. The membership, which is over 600, is made up of registered medical practitioners and of honorary corresponding members. The regular publication of the association is the *Journal of Mental Science*. The association is subdivided into five divisions, which also hold divisional meetings. Meetings are held on the third Thursday in February at some city in Britain other than London, and in the latter city on the third Tuesday in May and November. The president in 1914 was D. G. Thomson, M.D., and the honorary secretary M. A. Collins, M.D.

MEDILL', Joseph (1823–99). An American journalist. He was born in New Brunswick, Canada, but at the age of eight removed with his parents to Stark Co., Ohio, afterward studied law and practiced his profession at Massillon. In 1849 he entered journalism and took charge of the Coshocton *Republican*, a Free Soil paper. Two years later he established the Cleveland *Forest City*, a Whig organ, but in 1852 united it with the *Free Democrat*, the new paper being called the *Leader*. A little after he left the Whig party and in 1854 was an organizer of the Republican party in Ohio. In 1856, with two partners, he bought the Chicago *Tribune*. In 1870 he helped frame a new State constitution for Illinois, in 1871 was appointed a member of the first Civil Service Commission, and in 1872 was elected mayor of Chicago. He spent a year in Europe (1873–74) and on his return became chief proprietor and editor in chief of the *Tribune*, and he continued in that position until his death. He was instrumental in establishing the Chicago Public Library and in securing the Columbian Exposition for Chicago.

MEDI'NA (Ar. *al Medinah*, the city; or more fully *Medinat al Nabi*, the city of the Prophet; called also *Tayyibah*, the perfumed, or *al Munawwarah*, the illumined; before the time of Mohammed known as *Yathrib*, whence it is mentioned by Ptolemy as *Jathrippa*). One of the sacred cities of Islam, the scene of Mohammed's labors after his emigration from Mecca (see Mohammed; Hejira), and the place of his tomb (Map: Turkey in Asia, D 6). It is about 250 miles north of Mecca and 140 north by east of the port of Yambu. The population was estimated by Burton at the time of his visit (1852) at 16,000; a later estimate places it at 50,000. In the third century A.D. the tribes of *Aus* and *Khazraj* emigrated to Yathrib from Yemen. It was by representatives of these tribes that Mohammed was invited to Medina; with them he entered into an alliance, and they were his "helpers" (*ansar*) after he had taken up his residence in Medina (622 A.D.), though among the members of both tribes there were many who hesitated, vacillated, and occasionally took sides with the opponents of the Prophet, the so-called *Munafiḳuna*. There was also a large Jewish

population in Medina, the leading tribes being the Kainuḳa and the Nadhir, who were driven out after the battle of Ohod (625), and the Ḳuraiza, who were slaughtered by the Moslems later. Medina remained the residence of Mohammed even after the capture of Mecca in 630, and he died there in 632. It was the capital of Abu Bekr (630–632), Omar (632–644) and Othman (644–656), until Ali removed the seat of government to Kufa (656–661) and Moawiyah made Damascus the capital of the Ommiad dynasty. It consists of three principal parts—a town, a fort, and suburbs of about the same extent as the town itself, from which they are separated by a wide space. Medina forms an irregular oval within a walled inclosure, 35 to 40 feet in height, and flanked by 30 towers—a fortification which renders the city the chief stronghold of Hejaz. Two of its four gates, viz., the *Bab al Jum'ah* (Assembly Gate, in the eastern wall) and the *Bab al Misri* (Egyptian Gate), are massive buildings with double towers. The streets, between 50 and 60 in number, are narrow and paved in only a few places. The houses are flat-roofed and double-storied and are built of a basaltic scoria, burned brick, and palm wood. Very few public buildings of any importance are to be noticed except the mosque, erected near the spot where Mohammed died. It is of smaller dimensions than that of Mecca, being a parallelogram, 420 feet long and 340 feet broad, with a spacious central area called *al Ṣaḥn*, which is surrounded by a peristyle with numerous rows of pillars. The Mausoleum, or *Ḥujrah*, itself behind the mosque proper, is an irregular square, 50 to 55 feet in extent, situated in the southeast corner of the building and separated from the walls of the mosque by a passage about 26 feet broad. A large gilt crescent above the "green dome" springing from a series of globes surmounts the *Ḥujrah*, a glimpse into which is attainable only through a little opening, called the Prophet's window; but nothing more is visible to the profane eye than costly carpets or hangings, with three inscriptions in large gold letters stating that behind them lie the bodies of the Prophet of Allah and the two caliphs (Abu Bekr and Omar) and an empty tomb for Jesus. These curtains, changed whenever worn out or when a new Sultan ascends the throne, are supposed to cover a square edifice of black marble, in the midst of which stands Mohammed's tomb. Its exact place is indicated by a long, pearly rosary (*Kaukab al Durrī*) suspended from the curtain. The Prophet's body is supposed to lie (undecayed) stretched at full length on the right side with the right palm supporting the right cheek, the face directed towards Mecca. Outside the drapery is the tomb of Fatima, the daughter of Mohammed. Close behind him is placed, in the same position, Abu Bekr, and behind the latter, Omar. The fact, however, is that when the mosque, which had been struck by lightning, was rebuilt in 892, three deep graves were found in the interior, filled only with rubbish. Many other reasons make it more than problematic whether the particular spot at Medina really contains the Prophet's remains. Of the fabulous treasures which this sanctuary once contained little now remains. As in Mecca, a great number of ecclesiastical officials are attached in some capacity or other to the mosque, as ulemas, imams, khatibs, etc.; and not only they, but the townspeople in general, live to a great extent on the pilgrims' alms, the city having little trade. The mosque was destroyed by fire in 1257 and was rebuilt 1258–88; it was restored in 1487 by Khaid Bey of Egypt. It is one of the very few mosques with three minarets. From 929 to 950 the Karmathians (see MOHAMMEDAN SECTS) were masters of the city. Medina recognized the authority of Selim I in 1517. It fell into the power of Saud, the Wahabi general, in 1803, and was reconquered by Tussun Pasha in 1815. There are few other noteworthy spots to be mentioned in Medina, save the minor mosques of Abu Bekr, Ali, Omar, etc. The private houses, however, surrounded by gardens, fountains, etc., have a very pleasing appearance, and the city, although in its decay, is yet busy and agreeable. A number of madrasahs, or endowed schools, represent what learning there is left in Medina, once famed for its scholars. As is the case with Mecca, non-Mohammedans are rigorously excluded from the sacred city, yet it has been visited by Varthema (1503), Wild (1604), Pitts (c.1685), Seetzen (1806), Burckhardt (1814), Wallin (1845), Burton (1854), Keane (1878), and Wavell (1912).

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MEDINA. A village in Orleans Co., N. Y., 41 miles west of Rochester and equally distant to the northeast from Buffalo, on Oak Orchard Creek, the Erie Canal, and the New York Central and Hudson River Railroad (Map: New York, B 4). It is in a fertile agricultural region and derives good water power from the creek, where a storage dam has been constructed. There are valuable sandstone quarries, foundries, iron works, pump works, flouring mills, and manufactories of furniture, shirts, vinegar, cigars, and extracts. Medina Falls are noted for their scenic beauty. Settled about 1830, Medina was incorporated in 1832. The present government is administered under a charter of 1874, which, as subsequently amended, provides for a president, annually elected, and a board of trustees who act with the executive in electing subordinate officials. Medina owns its water works. Pop., 1900, 4716; 1910, 5683.

MEDINA. A village and the county seat of Medina Co., Ohio, 32 miles southwest of Cleveland, on the Baltimore and Ohio and the Northern Ohio railroads (Map: Ohio, G 3). It contains the Pythian Sisters' Home, Sylvester Library, and the beautiful Spring Grove cemetery. The chief industrial establishments are bee-supply works, foundries, and bending works. The surrounding country is adapted to farming. Pop., 1900, 2232; 1910, 2734.

MEDINA. The sister of Elissa and Perissa, in Spenser's *Faerie Queene*. She represents the golden mean.

MEDINA, mâ-dē'nâ, JOSÉ TORIBIO (1852–). A Chilean bibliographer and historian,

born in Santiago de Chile. He was educated at the National Institute and the University of Santiago, receiving the law degree in 1873. In 1874 he was appointed secretary to the Chilean Legation at Lima, where he made investigations in the archives during his spare time. Thence he traveled in the United States and Europe, visiting libraries and archives. Returning to Chile in 1878, he served in the Chilean-Peruvian War and at its close was appointed judge in the newly acquired territory. In 1884 he was made secretary to the Chilean Legation at Madrid and was commissioned by the government to make investigations in the Spanish archives respecting the history of Chile. After several years' study in Spain, he returned to Chile, but in 1902 he made a third voyage to the United States and Europe to continue his studies. He spent his life in investigation, writing, editing, and publishing, having set up a printing plant in his own house. His first literary effort was a translation of Longfellow's *Evangeline* (1874). His fame, however, rests upon his indefatigable investigations in history and bibliography, in which he spent more than 35 years. He ranks as one of America's greatest bibliographers. His principal work, the *Biblioteca hispano-americana, 1493–1810* (7 vols., 1898–1907), is remarkably erudite and valuable, containing the description of about 10,000 books. Other works of the same character are *Historia y bibliografía de la imprenta en el antiguo virreinato del río de la Plata* (1892), *La imprenta en Manila desde sus origenes hasta 1810* (1896), *Biblioteca hispano-americana septentrional* (1897), *Biblioteca hispano-chilena, 1523–1817* (3 vols., 1897–99), *La imprenta en Bogotá, 1739–1821* (1904), *La imprenta en Guadalajara de México, 1793–1821* (1904), *La imprenta en Guatemala, 1660–1821* (1910), *La imprenta en la Habaña, 1707–1810* (1904), *La imprenta en Lima, 1584–1824* (4 vols., 1904–07), *La imprenta en México* (1907 et seq.), *La imprenta en puebla de los Angeles, 1640–1821* (1908), and many similar works covering books published in various cities of Spanish America. His historical works, all based upon manuscript sources, include *Historia de la Inquisición en Lima* (1887), *El Tribunal del Santo Oficio de la Inquisición en Chile* (2 vols., 1890), *Juan Diaz de Solis* (2 vols., 1897), *La Inquisición en las Islas Filipinas* (1899), *La Inquisición en México* (1905), *El Portugués Estebán Gomez* (1908), *El veneciano Sebastian Caboto* (2 vols., 1908). He also published *Medallas coloniales hispano-americanas* (1900), *La instrucción pública en Chile* (2 vols., 1905), *Diccionario biografico colonial de Chile* (1906), and many other works, and edited 30 volumes of the *Colección de documentos ineditos para la historia de Chile.* Consult V. M. Chiappa, *Noticias acerca de la vida y obras de Don José Toribio Medina* (Santiago, 1907).

MEDINA DE RIO SECO, dā rē′ō sā′kō. A small town of Spain, in the Province of Valladolid, 20 miles northwest of the city of that name (Map: Spain, C 2). Here, on July 14, 1808, a Spanish army of 50,000 was defeated by 12,000 French. Pop., 1910, 4949.

MEDI′NA SERIES. A subdivision of the Silurian system, of which it forms the basal part, or else is preceded only by the Oneida conglomerate. The rocks are conglomerates, sandstones, and shales. They are abundant in the eastern United States, and attain a thickness of over 1000 feet in New York and Pennsylvania. At Medina and other places in western New York large quarries of building stone occur in the formation. See GEOLOGY; SANDSTONE.

MEDINA SIDONIA, mā-dē′nä sē-dō′nyä. A town of south Spain, in the Province of Cadiz, situated on a steep eminence, 20 miles southeast of Cadiz (Map: Spain, C 4). It has a picturesque appearance, contains a beautiful Gothic church and the ruins of the ancestral palace of the dukes of Medina Sidonia. Pop., 1900, 11,003; 1910, 11,602. The dukes of Medina Sidonia played an important part in the internal political life of Spain, and to one of them was intrusted the command of the Armada for the invasion of England in 1588. See ARMADA.

MEDINA SIDONIA, DON ALONSO PEREZ DE GUZMAN, seventh DUKE OF (1550–1615). A Spanish admiral who is safe from deserved oblivion because he commanded the ill-fated Armada, which was defeated by the English in 1588. In his time he was the highest (and richest) nobleman in Spain, and although he lacked ability, naval training, and stomach for the sea, Philip II placed him in supreme command of his "invincible" fleet, because his rank would insure the obedience of the officers under him. Philip did not regard the confessed incompetence of the Duke as a serious obstacle to the success of the expedition, for he had very detailed instructions and also a technical adviser. The charge of personal cowardice is probably unmerited. On his return to Spain with the remnants of the Armada he had not the good fortune to sink into obscurity. He was "captain general of the ocean sea" and commander of the Spanish forces which failed to prevent the sack of Cadiz in 1596, and he bears responsibility for the defeat of a Spanish squadron off Gibraltar in 1606. Consult: *Documentos relativos á Don Alonso de Guzman el Bueno, séptimo duque de Medinasidonia* (Madrid, 1856), being volume xxviii of the *Colección de documentos inéditos para la historia de España*; C. Fernández Duro, *La Armada Invencible* (2 vols., ib., 1884–85); J. K. Laughton (ed.), *State Papers Relating to the Defeat of the Spanish Armada, Anno 1588* (2 vols., London, 1894); J. S. Corbett, *Drake and the Tudor Navy* (2 vols., ib., 1898); *Cambridge Modern History*, vol. iii (New York, 1905).

MEDINET EL FAYUM, me-dē′nĕt el fī-o̅o̅m′. The capital of the Egyptian Province of Fayum (q.v.), situated on the Bahr-Yusuf, 55 miles south of Cairo (Map: Egypt, C 2). It is a well-built town, with an interesting mosque and a fine bazar. The chief industry is the manufacturing of woolens; there is a considerable trade in grain, woolens, and roses. The town is the seat of an American mission. Pop., 1897, 31,262; 1907, 37,320.

MEDÎNET HABU, me-dē′nĕt hä-bo̅o̅′. The modern Arabic name of a ruined Coptic village, built in early Christian times, on the west bank of the Nile in about lat. 25° 50′ N. It stood around and upon the ruins of a group of temple buildings in the western quarter of ancient Thebes. These ruins include a small temple built by Queen Hatasu and King Thothmes III, with additions by several later monarchs, and a large temple built after the model of the Rameseum (q.v.) by Ramses III. The larger temple originally stood within an inclosure surrounded by a wall of which considerable traces yet remain. The main entrance to the inclosure is through a gateway in a massive pavilion built

in imitation of a Syrian fortress and containing several chambers whose walls are beautifully decorated with reliefs. Within the inclosure a great pylon gate faces the pavilion and gives entrance to a colonnaded court 115 feet in length and about the same in breadth. A second pylon gate forms the entrance to a second colonnaded court (125 feet long and 138 feet broad) which in Christian times was converted into a church. At the upper end of this court is a terrace from which a door leads to the hypostyle hall, supported by 24 columns. To the rear of the hall are two smaller halls and a number of chambers, most of which are in a ruinous condition.

Close to the temple of Ramses III lie the buildings of the smaller temple. Between two pylons—the outer built by Ptolemy X, the inner by Taharka—is a small chapel (32 feet long), built by Nectanebo. The inner pylon forms the entrance to a court, at the upper end of which is the temple built in the eighteenth dynasty by Hatasu and Thothmes III. It consists of a chamber surrounded by a colonnaded portico and adorned with reliefs and inscriptions. To the rear lie six smaller chambers, in one of which is a shrine for a divine image. Consult: *Description de l'Egypte* (Paris, 1809–29); Sir J. G. Wilkinson, *Topography of Thebes* (London, 1835); Johannes Dümichen, *Geschichte des alten Aegyptens* (Berlin, 1878); Daressy, *Notice explicative des ruines de Medinet Habu* (Cairo, 1897). See also THEBES.

MEDING, mā'dĭng, OSKAR (1829–1903). A German novelist, whose pseudonym was Gregor Samarow. He was born in Königsberg, Prussia, studied law, and in 1870 retired from the civil service. From 1873 to 1879 he lived in Berlin and then at Castle Wohldenberg, and in 1900 settled at Charlottenberg. His novels are sensational and deal mostly with modern politics. He wrote, under the pseudonym of Samarow, *Um Scepter und Kronen*, a cycle (1872–76); *Die Römerfahrt der Epigonen* (1874; 4th ed., 1887); *Höhen und Tiefen* (20 vols., 1879–80); *Krieg oder Frieden* (1897); *Ein Gespenst* (1902). He also wrote under his own name and the pseudonym Leo Warren. More purely historical and biographical are his *Memoiren zur Zeitgeschichte* (1881–84); *Erinnerungen aus der Zeit der Gärung und Klärung* (1896); *Aus vergangenen Tagen* (1896).

ME'DIOLA'NUM. The Latin name of Milan (q.v.).

MEDITERRANEAN (mĕd'ĭ-te-rā'nê-an) **FEVER.** See MALTA FEVER.

MEDITERRANEAN RACE (Lat. *mediterraneus*, midland, from *medius*, middle + *terra*, land). That portion of the white or Caucasian division of mankind dwelling now or formerly about the Mediterranean Sea, characterized by long heads and faces, dark brown or black hair, dark eyes, medium stature, slender bodies, and broad noses. It is called Iberian by English ethnologists, Ligurian by the Italians, Ibero-Insular or Atlanto-Mediterranean by Deniker, and Ibero-Pictish by Rhys.

There are four subraces of the Mediterranean race. In the southwestern portion of Europe, including Spain and Portugal, and moving onward as far as Iceland and Scotland, were the Iberians (q.v.), who left their name on the Iberian peninsula. In the middle projection into the Mediterranean were the Ligurian subrace, whose territory stretched westward into southern France. The eastern peninsula and the isles of Greece were the home of the Pelasgians (q.v.), who moved northwestward through ancient Illyricum into Italy and are supposed to have been of one race with the Hittites (q.v.) of Asia Minor. The northeastern and north African subrace may be called in general terms Hamite (see HAMITES), to which belonged among others the Egyptians and Libyans. Consult Giuseppe Sergi, *The Mediterranean Race* (New York, 1901), with references to his numerous writings and the best authorities.

MEDITERRANEAN SEA. A great inland sea of the Eastern Hemisphere, almost entirely inclosed by the continents of Europe, Asia, and Africa, and communicating with the Black Sea by the Dardanelles, the Sea of Marmora, and the Bosporus (Map: Europe, D 5). It extends from long. 5° 21′ W. to 36° 10′ E., a distance of 2320 miles. Its breadth differs widely in different parts, the maximum breadth being 1080 miles. It is connected with the Atlantic by the Strait of Gibraltar. The south or African coast is comparatively smooth and unindented. The north or European coast, on the other hand, is extremely broken, with several long peninsulas, deep bays and gulfs, and many islands. It abounds in good harbors, which early conduced to extensive commerce. The Balearic Isles, Sardinia, Corsica, Sicily, Crete, and Cyprus are the largest islands. The Italian peninsula, with Sicily and the extended shallows that lie between Sicily and Tunis, divides the Mediterranean into two parts.

The depth of the Mediterranean differs greatly in different parts, the maximum depth being 14,400 feet in the eastern basin south of the Morea and 12,200 feet in the western basin east of Sardinia. The depth at the Strait of Gibraltar is over 2500 feet, while 50 miles outside the water shoals to 1200 feet. The specific gravity and salinity of the water are slightly greater than those of the Atlantic, probably because of greater evaporation over the Mediterranean, the proportions being 1.029 to 1.028. The temperature of the surface water in summer is commonly a few degrees higher than that of the Atlantic in the same latitudes, and the temperature at depths is much higher, as is often the case in partly inclosed seas. While the temperature in the greater depths of the Atlantic is very near the freezing point, in the Mediterranean it reaches only 54° F. to 56° F. In winter the surface temperatures do not differ materially. The tides are very slight, at most places being only a few inches in height. In the summer the northeast trades blow over the Mediterranean, while in the winter, with the shifting of the wind belts, the prevailing winds are westerly. Specially designated winds are the Bora, in the Adriatic, and the Sirocco, blowing from the African desert.

The great rivers which flow into the Mediterranean are few in number, the principal ones being the Ebro, Rhone, and the Po from Europe, and the Nile from Africa. Into the Black Sea flows much more water, hence there is a constant current from the Black Sea into the Mediterranean. From the Atlantic flows a constant surface current into the Mediterranean, due probably to the excess of evaporation over supply in the latter body of water, while there is a lower current flowing in the contrary direction. The chief divisions of the Mediterranean are known as the Levantine Sea (in the east), the Ægean Sea, Ionian Sea, Adriatic Sea, Tyrrhenian Sea

(immediately west of the peninsula of Italy), and Balearic Sea.

Of the European sea fishes over 400 species inhabit the Mediterranean Sea, some of which are peculiar to it. It has a greater number of species than the British and Scandinavian seas, but does not nearly so much abound in useful kinds. The sponge, tunny, and sardine fisheries are important on some parts of its coasts. It is rich in red coral, which is procured in great quantity on the coasts of Provence, of the Balearic Isles, and of Sicily, but particularly on the coasts of Tunis and Tripoli in Africa.

The shores of the Mediterranean Sea are in many parts subject to frequent earthquakes. Besides the existing active volcanoes of Etna, Vesuvius, and Stromboli, there are many evidences of recent volcanic action, and instances have occurred of islands suddenly upheaved by it, where volcanic fires have appeared for a short time.

Bibliography. W. H. Smyth, *The Mediterranean: Memoir Physical, Historical, and Natural* (London, 1854); R. L. Playfair, "The Mediterranean, Physical and Historical," in *Smithsonian Institution Report, 1890* (Washington, 1891); J. Cook, *The Mediterranean and its Borderlands* (Philadelphia, 1910); Angelo Mosso, *Dawn of Mediterranean Civilization* (London, 1910).

MEDITERRANEAN SUBREGION. In zoögeography, that subdivision of the Palæarctic region which includes the basin of the Mediterranean Sea, Asia Minor, Persia, and the south coast of Asia as far as the Indus. The Canary, Azores, and Madeira islands are also included. It is bounded on the north by the line of mountains which extends from the Pyrenees to the Himalayas, and on the south by the Atlas Mountains, the deserts of northwestern Africa and central Arabia, and east of that by the Indian Ocean. It is a region of subtropical warmth, and except along the north shore of the Mediterranean is largely treeless, arid, and elevated. Within recent times the Mediterranean has been of much less extent, enabling animals to pass freely across its basin at two or more places; and much of the country now barren was formerly wooded. It is not surprising to find, therefore, a general similarity and great variety of life throughout the entire area. Among the possible indigenes of this subregion were the horse, camel, and some other now wholly domesticated animals. Of the few remaining or recently extinct mammals of the larger sort, the Barbary ape, fallow deer, aoudad, moufflon (of Sardinia), and civets are most prominent. Several gazelles and antelopes, which do not range south of the Sahara, the Asiatic wild ass, and many small animals are peculiar. Most of the north European birds pass across it in their migration to and from their winter homes; but it has many resident species of its own, especially among the birds of prey and the game birds. See DISTRIBUTION OF ANIMALS; and consult the accompanying maps, and the authorities there cited.

MEDJIDIE, mĕ-jĭd'ĭ-ā (Turk. *majīdī*, from Turk., Ar. *majīd*, glorious, from Ar. *majd*, glory, from *majada*, to be glorious). A Turkish order of distinction, first instituted in 1852 by the Sultan Abd ul Medjid. The Order of Medjidie has five classes, each differing in size, the decoration on which is a silver sun of seven triple rays, the crescent and star alternating with the rays. In the centre of the decoration, on a circle of red enamel, are the legend signifying "zeal, honor, and loyalty" and the date 1268, the Mohammedan calendar year corresponding to 1852. The Sultan's name is inscribed on a gold field within this circle. The first three classes of the order are worn suspended from the neck, and the fourth and fifth on the left breast. A star closely resembling the badge is worn on the left breast by the wearers of the first-class order, and on the right breast by those of the second class. The ribbon is red with green borders. See Plate of ORDERS.

MED'LAR (OF. *medler, mesler, meslier*, medlar tree, from *mesle, mesple, neple*, Fr. *nèfle*, It. *nespila*, medlar fruit, from OHG. *mespila, nespela*, Ger. *Mispel*, medlar, from Lat. *mespilus*, Gk. *μέσπιλον, mespilon, μεσπίλη, mespilē*, medlar; probably connected ultimately with Heb. *shāpēl*, to be low), *Mespilus*. A genus of trees or shrubs of the family Rosaceæ sometimes combined with the genus *Pyrus* by botanists. The common medlar (*Mespilus germanica*), a large shrub or small tree, spiny in a wild state, but destitute of spines in cultivation, is a native of, and in general cultivation in, the south of Europe and the temperate parts of Asia, seldom seen in America. It has lanceolate leaves, not divided nor serrated, solitary large white flowers at the ends of small spurs, and somewhat top-shaped fruit, of the size of a small pear or larger, according to the variety. The fruit is very astringent, even when ripe, and is not eaten until its tough pulp has become soft and vinous by incipient decay.

MEDLEY. See POTPOURRI.

MED'LEY, SAMUEL (1738–99). Baptist pastor in Liverpool, England, from 1772, and favorite hymn writer. In early life he was in the navy, but was obliged to retire on account of wounds in 1759. He then taught school, till in 1767 he became a preacher. Two of his hymns, "Oh, could I speak the matchless worth" and "Awake, my soul, to joyful lays," are well known. Collections of his hymns were published in 1785, 1794, and 1800. Consult *Memoirs* by his son (1800) and his daughter (1833).

MÉDOC, mā'dŏk'. See WINE.

MEDOWS, mĕd'ōz, SIR WILLIAM (1738–1813). An English soldier. In 1756 he entered the British army, in which he served for many years, first in Germany, then in the war with the American Colonies, in which he commanded the Fifty-fifth Regiment. He was soon placed at the head of the First Brigade of Grenadiers and distinguished himself by his bravery at the battle of Brandywine and in the expedition of 1778 against Santa Lucia. He afterward lived in India from 1783 to 1792, was Governor of Bombay in 1788–90, and commander in chief of Madras in 1790–91. His military renown was greatly increased by gallant conduct at the siege of Seringapatam in 1792, and in 1793 the rank of lieutenant general was conferred upon him. In 1798 he was made general and was Governor of the Isle of Wight, and afterward, as the successor of Cornwallis, was commander in chief in Ireland (1801–03).

MEDRANO, mā-drä'nō, FRANCISCO DE. A Spanish poet of the late sixteenth and early seventeenth centuries, born at Seville. (He is not to be confused with the Sevillan cleric and poet, Dr. Sebastián Francisco de Medrano, who died in 1653.) It is known that he visited Rome, but no other details of his life are authenticated. He is one of the best of Spanish lyric poets, and is especially noted for his odes in the manner of Horace. His works

were first published at the end of the *Sestinas*, or *Remedios de Amor* (an imitation of Ovid), composed by Pedro Venegas de Saavedra, a poet of Seville (1617). They are reprinted in Rivadenera's *Biblioteca de autores españoles*, vols. xxxii, xxxv, and xlii (1854); and the author's name appears in the Academy's *Catálogo de autoridades de la lengua*.

MEDRESS, or **MEDRESSE**. See MADRASAH.

MEDUL'LA OB'LONGA'TA. See NERVOUS SYSTEM AND BRAIN.

MED'ULLARY RAY (Lat. *medularis*, pertaining to marrow, from *medulla*, marrow). The woody cylinder of stems is usually broken up into what are called "vascular bundles" by plates of intervening tissue. These vertical plates, which in cross section are seen to radiate from the pith to the cortex, crossing the vascular cylinder, are medullary rays or pith rays. These plates are relatively short in the vertical direction, so that they do not divide the woody cylinder into long bundles. When secondary thickening occurs in a woody stem new medullary rays begin in the new wood. In the cross section of a woody stem several years old, therefore, two kinds of medullary rays appear, viz., the primary ones, which extend from pith to cortex, and secondary ones, which traverse only the new wood or parts of it. See WOOD.

MEDULLARY SARCO'MA. A variety of cancer, also known as encephaloid, cellular cancer, medullary cancer, fungus medullaris, etc. It grows more quickly, distributes itself more rapidly, attains a more considerable bulk, and is more rapidly fatal than any other form of cancer. See TUMOR.

MEDUL'LA SPINA'LIS. See NERVOUS SYSTEM AND BRAIN.

MÊDÛM, mâ-dōōm'. A village in Egypt, on the western side of the Nile, some 40 miles south of Cairo, in about lat. 29° 30′ N. Near it, on the edge of the desert, is the pyramid of King Snefru (q.v.), the first King of the fourth dynasty and the immediate predecessor of King Cheops (q.v.). From a great mass of rubbish, which covers its base, it rises in three stages to the height of about 122 feet, the upper stage being almost entirely destroyed. The outer walls consist of finely polished blocks of Mokattam stone, beautifully joined together. The pyramid was opened in 1881 by Maspero, who discovered a long passage leading from the north face into the sepulchral chamber, which is built upon the surface of the underlying rock. The chamber had, however, been robbed as early as the time of the twentieth dynasty, and in it were found only some broken fragments of the wooden coffin and a wooden jar. Flinders Petrie, who later made a careful examination of the pyramid, found against its eastern face a funerary chapel consisting of an open court and two small chambers. Ancient visitors to the chapel had left upon its walls numerous graffiti, in five of which Snefru is mentioned as the King to whom the pyramid was attributed. Petrie's researches showed that the present peculiar form of the pyramid resulted from the removal of its outer layers in order to obtain stone for building purposes.

Near the pyramid are the tombs (mastabas, q.v.) of a number of high personages of Snefru's court. The most important of them are the mastabas, richly adorned with mural paintings, of Prince Rê-hotep and Nofret, his wife, and of Prince Nofer-ma't and his spouse, Yetet. The statues of Rê-hotep and Nofret, found in their tomb, are now in the Museum of Cairo. In the cemetery of Mêdûm have been found a number of graves exhibiting a peculiar mode of burial. The bodies lie upon the left side, with the face towards the east and the knees drawn up; coffins and the usual accessories of Egyptian graves are absent. Consult W. M. F. Petrie, *Mêdûm* (London, 1892), and British School of Archæology in Egypt, *Meydum and Memphis*, vol. iii (ib., 1910).

MEDUNTA. See NANTES.

MEDU'SA. See GORGO.

MEDUSA (Lat., from Gk. Μέδουσα, *Medousa*, name of one of the three Gorgons, from μέδειν, *medein*, to rule). A general name applied to the disklike, umbrella-shaped jellyfish, with long marginal feelers, and so called from their resemblance to the fabled Medusa's head. (See Plate.) While the term "medusa" is now generally applied to the sexual free-swimming adult stage of any hydroid, it is particularly applicable to our common North Atlantic *Aurelia flavidula* of the class Scyphozoa (the group formerly called Discophora). Another general name is acaleph.

Our most abundant medusa is *Aurelia flavidula*, which late in summer abounds along the coast from New York northward. It grows to

FIG. 1. AURELIA FLAVIDULA.
Adult, natural size, seen from above.

the diameter of from 8 to 10 inches, becoming fully mature in August. Its rather tough jellylike disk is moderately convex and evenly curved, while four thick oral lobes depend from between the four large genital pouches; the edge of the disk is minutely fringed to the ends of the tentacles. On the fringed margin are eight eyes, each covered by a lobule and situated on a peduncle, and occupying as many slight indentations, dividing the disk into eight slightly marked lobes. The subdivisions of the water-vascular canals or tubes are very numerous and anastomose at the margin of the disk, one of them being in direct communication with each eye peduncle. When in motion the disk contracts and expands rhythmically, on the average 12 or 15 times a minute. On the approach of danger the

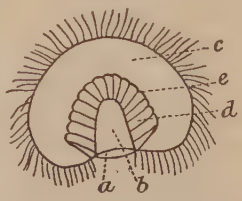

FIG. 2. GASTRULA OF AN AURELIA-LIKE MEDUSA.
a, primitive mouth; *b*, gastrovascular cavity; *c*, ectoderm; *d*, endoderm; *e*, mesoderm layer.

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1 DESMOMEMA ANNASETHE, 3/5 NATURAL SIZE, FROM SOUTH AMERICA
2 FLOSCULA PROMETHA, 3/5 NATURAL SIZE, FROM INDIAN OCEAN
3 CHRYSAORA MEDITERRANEA, 1/6 NATURAL SIZE, FROM SMYRNA
4 CYSTALIA MONOGASTRICA, MAGNIFIED FOUR TIMES, FROM CEYLON

animal sinks below the surface. Though it has lasso cells, it is not poisonous to bathers, while the great *Cyanea arctica* is very much so.

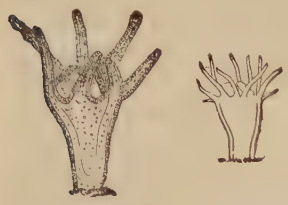

FIG. 3. SCYPHISTOMA OF AURELIA FLAVIDULA, AT DIFFERENT STAGES. Magnified. (After Agassiz.)

The *Aurelia* spawns in late summer, the females being distinguishable by their yellow ovaries, the corresponding male gland being roseate, while the tentacles of the female are shorter and thicker than in the males. The eggs pass out of the mouth into the sea along the channeled arms, and in October the ciliated gastrula (Fig. 2) becomes pear-shaped and attaches to rocks, dead shells, or seaweeds, and then assumes a hydra-shaped scyphistoma stage (Fig. 3), with often 24 very long tentacles; in this stage it remains about 18 months. Towards the end of this period the body increases in size and divides into a series of cup-shaped disks. These saucer-like disks are scalloped on the upturned edge, tentacles lead out, and the animal assumes the strobila stage (Fig. 4). Finally the disks separate, the upper one becomes detached and with the other disks swims away in the ephyra form (Fig. 5). When about a fifth of an inch in diameter, and towards the middle or end of the summer, this young medusa becomes an adult aurelia.

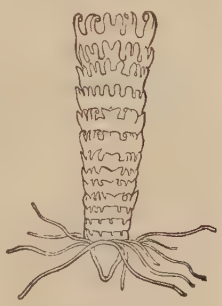

FIG. 4. STROBILA OF AURELIA FLAVIDULA.

Other forms of greater beauty occur in the Mediterranean and the tropics. A much larger kind of medusa than *Aurelia*, *Cyanea arctica*, is common on the Grand Banks and off the coast of northern New England. It sometimes attains a diameter across the disk of from 3 to even 5 feet, though it is produced from a scyphistoma not more than half an inch in height. Its tentacles stream behind, sometimes to the length of several fathoms, and poison the hands of fishermen. Species of *Pelagia* do not undergo an alternation of generations (see PARTHENOGENESIS), but grow directly from the egg, without passing through a strobila stage.

FIG. 5. EPHYRA OR EARLIEST FREE CONDITION OF AURELIA. (After Agassiz.)

For various Mediterranean and tropical forms, see Colored Plate of MEDUSÆ AND SIPHONOPHORE.

Medusæ shelter various kinds of animals, which live as fellow boarders or commensals, i.e., temporary nonattached parasites. Some of them live in or under the mouth cavity or between the four tentacles of the larger medusæ. Such is the little amphipod crustacean, *Hyperia*, which lives within the mouth, while small fishes, such as the butterfish, swim under the umbrella of the larger jellyfishes, *Cyanea*, etc., for shelter and protection. Besides small animals of various classes, the larger jellyfishes kill by means of their nettling organs small cuttlefishes and true fishes, the animals being paralyzed by the pricks of the minute barbed darts. See CŒLENTERATA; CTENOPHORA; NEMATOCYST.

Fossil Medusæ. Because of the jelly-like nature of the body and the absence of any hard parts in medusæ, these animals would seem to present the most unfavorable conditions for fossilization. Indeed, they are rarely found in the ancient rocks, but there are some noteworthy exceptions, especially in the Cambrian and Jurassic formations. Impressions and also what have been considered to be casts of the medusoid bodies have been found in rocks of the Lower Cambrian in both Sweden and North America. The peculiar fossil called *Dactyloidites* found in the green roofing slates of Granville, Washington Co., N. Y., is generally regarded as of this nature. Fine impressions of jellyfish are found in the surfaces of the fine-grained lithographic limestones of Jurassic age at Solenhofen and other places in Bavaria.

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MEDU'SITES. The name of peculiar star-shaped fossils that are found in the Lower Cambrian strata of Sweden. They are thought to represent the casts of the gastric cavities of jellyfishes, thus indicating the existence of medusæ in the earliest Paleozoic time.

MED'WAY. A town in Norfolk Co., Mass., 25 miles from Boston, on the Charles River and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 4). There are manufactories of straw and felt goods and woolens. The water works are owned by the town. Pop., 1900, 2761; 1910, 2696. Medway was once part of Medfield, but was incorporated as a town in 1713. On Feb. 21, 1676, the town was ravaged by King Philip and several of its inhabitants killed.

MED'WIN, THOMAS (1788–1869). The biographer of the poet Shelley, born at Horsham in Sussex, England, March 20, 1788. His mother, Mary, a daughter of John Pilfold, was first cousin to Elizabeth Pilfold, the mother of Shelley. Medwin and Shelley were educated at Sion House School, Brentford, and they spent their vacations together at Horsham. Medwin entered the army and became a lieutenant in 1813. With his regiment he passed some time in India. In 1819 he retired on half pay and soon quitted the service. In 1821 he went to Italy, where he associated intimately with Shelley and Lord Byron. He afterward led an unsettled life. He died at Horsham, Aug. 2, 1869. His *Journal of the Conversations of Lord Byron* (1824) created a sensation, owing to its personalities. A *Memoir of*

Shelley (1833) was afterward expanded into *The Life of Shelley* (2 vols., 1847), of which a recent edition (Oxford) appeared, with introduction and commentary by H. Buxton Forman, in 1913.

MEEHAN, mē′an, THOMAS (1826–1901). An American botanist and horticulturist, born at Potter's Bar, near London, England, and educated in the public schools of his native town and of Kew. In 1847 he came to America to manage Buist's nursery at Rosedale, near Philadelphia, and six years later started his own nurseries at Germantown. Meehan was prominent in Philadelphia, as a member of the council and "father of the small parks." He proposed the theory that sex is determined by the vitality of the branch bearing the flower. In 1883 he was elected to the city council of Philadelphia and held this office for several terms. As a member of the Philadelphia Academy of Natural Sciences and of the American Association for the Advancement of Science, he contributed to their *Proceedings*. He edited the *Gardeners' Monthly* from 1859 to 1889 and *Meehan's Monthly* from 1892 to 1901 and wrote *An American Handbook of Ornamental Trees* (1853), *The Native Flowers and Ferns of the United States* (1st series, 1878; 2d, 1880; 3d, 1887), and *Wayside Flowers* (1881).

MEEK, ALEXANDER BEAUFORT (1814–65). An American journalist and jurist. He was born in Columbia, S. C., graduated at the University of Alabama in 1833, and, having studied law, was admitted to the State bar in 1835. He served in Florida as a lieutenant of volunteers against the Seminoles in 1836 and was Attorney-General of Alabama in 1836. He was made county judge in 1842. In 1853 and 1859 he was a member of the State Legislature. There he distinguished himself by organizing and establishing the free-school system in Alabama. From 1848 to 1852 he was associate editor of the Mobile *Register*. He was a probate judge at Mobile (1854–55) and a member and Speaker of the Legislative Assembly (1859–61). He wrote: *Red Eagle* (1855); *Songs and Poems of the South'ron* (1857); *Romantic Passages of Southwestern History* (1857); an unfinished *History of Alabama*.

MEEK, FIELDING BRADFORD (1817–76). An American geologist and paleontologist, born at Madison, Iowa. In 1848 he assisted in the geological survey of Iowa, Wisconsin, and Minnesota, and after completing this work was attached to the New York State Geological Survey under the leadership of James Hall. He accompanied F. V. Hayden in 1853 on a geological expedition to Dakota. During the latter part of his life he was engaged in describing the fossil invertebrates collected by government expeditions; particularly by the geological surveys of the United States and Canada. He identified and defined a large number of new species. His larger works are: *Paleontology of the Upper Missouri* (1865); *Check-List of the Invertebrate Fossils of North America* (1864); *Report on the Invertebrate Cretaceous and Tertiary Fossils of the Upper Missouri Country* (1876).

MEEK'ER, ROYAL (1873–). An American statistician, born at Silver Lake, Susquehanna Co., Pa. He graduated from Iowa State College in 1898 and studied at Columbia University (1899–1903; Ph.D., 1906) and at the University of Leipzig (1903–04). He was professor of history, politics, and economics at Ursinus College, Collegeville, Pa., in 1905–06, and at Princeton University he served as preceptor in 1906–09 and as assistant professor of political economy in 1909–13. In 1913 he was appointed by President Wilson Commissioner of Labor Statistics. He wrote a *History of Shipping Subsidies* (1905) and contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA.

MEERANE, mâ-rä′ne. A flourishing industrial town in the Kingdom of Saxony, 37 miles south of Leipzig (Map: Germany, E 3). It is an important centre of the textile industry and has a number of manufactories of woolen and semiwoolen materials, spinning and dyeing establishments, machine and boiler works, and manufactures of footwear, paper boxes, electric motors, buttons, and cement. Its chief educational establishments are a Realschule, a school of commerce, and a textile school. The products of Meerane are extensively exported to the Orient and America. Pop., 1900, 23,797; 1910, 25,470, chiefly Protestants.

MEERKAT, mēr′kăt, or **SURICATE,** sū′-rĭ-kāt (Dutch, sea cat). A small, furry, diurnal, vegetable-eating and burrowing civet (*Suricata tetradactyla*) of South Africa, allied to the mongooses. It is gregarious, and a colony makes burrows close together, like a prairie-dog "town." In captivity it becomes an amusing and delightful pet. Consult Martin, *Home Life on an Ostrich Farm* (New York, 1903).

MEERSCHAUM, mēr′shąm (Ger., sea foam), or SEPIOLITE. A compact, earthy mineral hydrated magnesium silicate. It is grayish white or white with a faint yellowish or reddish tint. It occurs in stratified earthy or alluvial deposits on the plains of Eski-Shehr and elsewhere in Asia Minor; also in Greece, at Hrubschitz in Moravia, and in Morocco. The deposits in Asia Minor are worked by pits and galleries at a depth of 24 to 30 feet. The mineral when brought to the surface is so soft as to be easily cut with a knife. It is scraped to remove any adhering material, dried in the sun for about a week, then again scraped and polished with wax. Meerschaum is used chiefly in the manufacture of bowls for tobacco pipes, and factories for their production exist in Austria and in France.

MEERUT, mē′rŭt. The capital of the district and division of Meerut, United Provinces, India, 39 miles northeast of Delhi, on the Northwestern Railway (Map: India, C 3). It is irregularly laid out, with narrow, unclean streets; there are several mosques and temples, of which the Jumma Musjid, dating from 1019, is the most noteworthy. The city has a fine town hall with a library, Meerut College, a normal school, and several church schools. The military cantonment is one of the largest and most important in India. There are excellent systems of water supply and drainage, and manufactures of soap, flour, and oil. The first uprising of the Indian Mutiny of 1857 occurred here. Pop., 1901, 118,-129; 1911, 116,227.

MEES, ARTHUR (1850–). An American musical conductor, born in Columbus, Ohio. He graduated in 1870 from Concordia College, Fort Wayne, Ind., and after preparation under American instructors he studied from 1873 to 1876 at Berlin under Kullak, Weitzmann, and Dorn (the latter for score reading and conducting). He was conductor of the Cincinnati May Festival Chorus, assistant conductor of the Chicago Orchestra, and then he took up his residence in New York and became the conductor of impor-

tant choral organizations. In 1898 he was elected, on the resignation of MacDowell, to the conductorship of the Mendelssohn Glee Club. In 1908 he became conductor of the Worcester Music Festival and the Cecilia Society of Boston. From 1887 to 1896 he wrote the analytical programmes for the New York Philharmonic Society. He published in 1901 *Choirs and Choral Music*, which has been accepted as a standard authority. A book of piano studies also obtained general recognition.

MEFISTOFELE, mā′fē-stō′fā-lā. An opera by Boito (q.v.), first produced in Milan, March 5, 1868; completely rewritten, Bologna, Oct. 4, 1875; in the United States (New York), Nov. 24, 1880.

MEG′ABAR′IE (from Gk. *μέγας, megas*, great + *βαρύς, barys*, heavy). The practical unit of pressure in the C. G. S. system; it equals one barie $\times 10^6$. See BARIE.

MEGACHIROPTERA. See BAT; CHIROPTERA.

MEG′ADAC′TYLUS (Neo-Lat., from Gk. *μέγας, megas*, great + *δάκτυλος, daktylos*, finger). A Triassic dinosaur. See ANCHISAURUS.

MEGÆ′RA. One of the Eumenides.

MEG′ALE′SIA, or **MEG′ALEN′SIA** (Lat., from Gk. Μεγαλήσια, from Μεγαλή, *Megalē*, epithet of the Great Mother, fem. sing. of *μέγας, megas*, great). A festival at Rome, instituted in honor of Cybele (q.v.), the Great Mother of the Gods, in 204 B.C., when her symbol, a black stone, was brought to Rome (consult Livy, 29, 14, and see the article CLAUDIA QUINTA). The celebration included a stately procession in which the eunuch priests of Cybele carried through the streets the sacred ensign, games held on the Palatine and in later times in the theatres, and a great carnival. The festival lasted for seven days, April 4 to 10, and was originally under the charge of the curule ædile, later of the prætor. Consult W. W. Fowler, *Roman Festivals* (London, 1899), and Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

MEG′ALICH′THYS. A genus of fossil ganoid fishes, characterized by their great size and formidable appearance. The body was covered by huge bony plates, and the teeth attained a length of 4 inches or more. The remains of *Megalichthys* are found in the Carboniferous rocks of Europe and America.

MEGALITH′IC MONUMENTS (from Gk. *μέγας, megas*, great + *λίθος, lithos*, stone). Gigantic monuments, the materials of which in the earliest stages of industrial development were huge undressed stones, and also associated with tumuli. Megalithic monuments are found in both hemispheres, and in the progress of culture they marked the crude beginnings of larger coöperative effort as well as of engineering and of massive architecture. A most instructive lesson as to the manner in which the stones were set on end is furnished by one of the northern tribes of Hindustan visited by Wurmbrand. These people are in a region where megalithic monuments have had a long history. A slab weighing several tons rests on a number of stout poles laid parallel and just far enough apart to allow men to walk between them. The ends of these poles are lashed to end bars and a firm gridiron frame is made beneath the slab. The whole mass is then lifted by as many men as can get into the framework, and carried to the proper place, one man beating time for their steps. The point of destination reached, the framework is laid flat, the hole dug, and the gridiron set upright by lifting with the hands aided by shear poles, sliding props, guy ropes, and all other labor-saving devices known to them. As the angle between the gridiron and the earth increases, the labor of erection decreases, until the slab is let down carefully into its resting place.

Megalithic monuments really belong to two classes, monolithic and polylithic. The former is a simple great slab or bowlder stood on end; the latter consists of several blocks put together to form a chamber. The differences between the two classes is not great, and there are mixed examples where both exist side by side.

Monoliths receive different names in the countries where they are found, and often the same name applies to quite different things in different countries. They receive names also from the manner of grouping. The single great stone, weighing perhaps hundreds of tons, set on end, is a menhir; if a number of these stand in rows, they become an avenue or an alignment; and a stone circle is a number of menhirs arranged about a centre. The final development of this simple beginning is seen in the Egyptian obelisk, in the memorial column or shaft, or in the gigantic statue. The enormous size of many of the rude monoliths is a matter of surprise. The largest one, in Brittany, at Locmariaquer, weighs 347 tons. Thousands have been counted in Brittany and other portions of France. See Plate of MEGALITHIC MONUMENTS.

The polylithic monument also receives different names from its associations. If a number of stones are built into a memorial pile, or over the dead, it is a cairn; a tumulus containing a dead person is in Ireland a galgal; and if a passageway be formed on one side allowing reëntrance to a vault, it becomes a chambered barrow; a stone box in a barrow to hold cinerary urns and relics is a cistvaen. The typical composite monument of great stones belonging to this class is the dolmen (locally termed quoit), a slab of stone laid on the top of two or more upright slabs, forming a burial chamber from which the earth has been removed by the elements. The word cromlech was at one time used to denote a dolmen, as it was originally covered with a tumulus and surrounded by a circle of standing stones. The term is out of use now in England, but the French apply it to one of the former elements of the complete dolmen, the stone circle. The essential part of all is the stone box or capsule, whether underground, aboveground, or covered with a tumulus.

The areas of greatest abundance of megalithic monuments, beginning in Asia, are to be found in Japan, Burma, Assam, and the Deccan; the Persian uplands; Asia Minor, Caucasus, the Crimea, Syria, Palestine, and Arabia; across northern Africa to the Atlantic; in Spain, Portugal, western France, and Belgium; in the British Isles and Scandinavia. Examples of huge monuments are also found in northeastern Asia. See EASTER ISLAND.

Stonehenge, on Salisbury Plain, near Amesbury, County of Wilts, southern England, is one of the most important among the megalithic monuments of the world, since it not only is composed of immense pieces, but combines in itself a number of types. In the centre lies a great slab 15 feet in length. Just outside of this are two oval rings, the larger one made up of five pairs of trilithons, which increase in

height towards the west. The smaller oval, containing 19 monoliths, is tapering in form; outside these ovals and inclosing them is a circle of standing stones, not massive in size; outside of all is the most interesting feature of Stonehenge, a circle 300 feet in circumference, made up of immense standing stones varying in height from 18 to 22 feet, some of them 6 feet in diameter. On the top of them are blocks of similar size joining them and forming a series of doorways or trilithons. On the outside of this circle is a ditch and avenue, in which is a menhir, called the Friar's Heel.

Not the least interesting feature about these remains is the veneration and folklore that has gathered around them. No doubt the belief that the ghosts of the dead hover about them aided in the preservation of many of them. Their authorship has puzzled the antiquaries as well as the folk, by whom they were attributed to the Druids, the Celts, and other historic peoples.

The megaliths of the Pacific islands pertain, with two exceptions, to the neolithic culture. They occur in a roughly orbicular line which somewhat closely corresponds to the outer boundary of the three divisions of the South Sea islands. Stone structures are reported by savage informants as existing in the inland valleys of Bougainville, Solomon Islands, but it is not yet safe to attempt exploration, and by Prebendary Codrington in Gog of the Banks group, and in New Caledonia; these are of Melanesia. In nuclear Polynesia occur the Nanga in Fiji, the trilithon of Tonga, in Samoa walls in the mountains and the Fale-o-le-Fe'e. In southeastern Polynesia walls and platforms are found in Rapa Iti, Pitcairn, and Easter islands, and walls in the Marquesas. In Micronesia there are stone remains on Howland Island; extensive remains at Tapak, Lele, and Metalanim in the Caroline Islands; interesting structures at Tinian in the Ladrones. The walls and platforms are built of unworked country rock, in general of cyclopean dimensions, erected without builder's art or any use of cement. There are a few instances of grouped stones, approximately of the cromlech type; such are the Nanga of Fiji, the Fale-o-le-Fe'e of Samoa, the alignments of Tinian. The trilithon type is represented by a solitary instance, that at Mua in Tonga; each upright is 17 feet high; they carry a crosspiece 5 feet deep sunk its full depth into sockets chipped in the full width of the uprights. In but three instances do these megaliths vary from the true unworked paleolithic—this trilithon, and the terminalia statues of Easter Island, the product of chipping, and the Tinian alignments which after chipping have been smoothed by abrasion. In not a single instance is it necessary to deduce the use of metal. The modern Polynesian, an advanced neolithic type, has been less than 1000 years in the Pacific. The appearance of age in these megaliths and the absence of tradition of their erection (all the more noteworthy in a race which recites the history of a fragile mat through 15 generations and the story of a greenstone spearhead from even remoter antiquity) are strong evidence that the megalithic monuments of the Pacific islands far antedate the arrival of the Polynesians and are the work of a lost population.

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MEGALOKASTRO. See CANDIA.

MEG'ALON'YX (Neo-Lat., from Gk. μέγας, *megas*, great + ὄνυξ, *onyx*, claw). An extinct edentate mammal, allied to *Megatherium*, found in the Pleistocene deposits of Kentucky, Tennessee, and Cuba. See MEGATHERIUM.

MEG'ALOP'OLIS (Lat., from Gk. Μεγαλόπολις, Great City). A town in Southwestern Arcadia, founded in 370 B.C. by Epaminondas (q.v.), who desired to make it the capital of an Arcadian confederacy and a bulwark against Sparta (Map: Greece, Ancient, C 3). Pausanius says 40 townships were combined to form the new city. It was laid out on a large scale, with strong walls 50 stadia (5½ miles) in circumference; it also had a large territory. But it by no means fulfilled expectations. It maintained its independence, indeed, against frequent Spartan attacks, sometimes with Athenian aid, sometimes with help from Macedon, but in 222 B.C. it was sacked by Cleomenes III. Though rebuilt, it never seems to have regained its importance. It was the native town of Philopœmen (q.v.), the great general of the Achæan League, and of the historian Polybius (q.v.). The city was situated in a fertile plain on both banks of the river Helisson, near its junction with the Alpheus. Excavations which were conducted on the site by the British School at Athens from 1890 to 1893 laid bare the theatre and the Thersileion, or great hall where the Arcadian Assembly met, and on the other (north) side of the river the temple of Zeus Soter, a long colonnade, and foundations of other buildings adjoining the market place.

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MEG'ALOSAU'RUS (Neo-Lat., from Gk. μέγας, *megas*, great + σαῦρος, *sauros*, lizard). A carnivorous dinosaur allied to, and perhaps identical with, *Ceratosaurus* (q.v.), found in the Jurassic and Cretaceous deposits of Europe and India. The North American genus *Lœlaps* of Cope from the Cretaceous formations is probably identical. The animal was from 15 to 20 feet long with a medium-sized head, the jaws of which were provided with formidable teeth. The skeleton is light, and the bones are partly hollow. The fore limbs are five-toed and small

1. "MERCHANT'S TABLE" NEAR LOCMARIAQUER

2. "LINES OF MENEC" AT CARNAC

and were probably of little use in locomotion. The hind limbs, on the other hand, are large and strong and terminate in three toes armed by heavy claws. The tail was long and heavy. See CERATOSAURUS; DINOSAURIA.

MEGANEURA, mĕg'ȧ-nū'rȧ. See INSECTS, FOSSIL.

MEGANITE. See EXPLOSIVES.

MEG'APHONE (from Gk. *μέγας, megas,* great + *φωνή, phonē,* voice, sound). A form of speaking trumpet used to render the voice audible at considerable distances. It consists of a large funnel of tin or papier-mâché, in which the sound waves are so reflected that they issue from its mouth in approximately parallel directions. Theoretically a megaphone of parabolic section would act as the best form of megaphone, especially if the resonance of the cavity did not affect the propagation of sound by strengthening certain sounds and destroying others by interference. (See ACOUSTICS.) The size and shape of the megaphone, however, are so regulated that the usual tones of the voice undergo the largest possible amount of strengthening. For this reason a megaphone to be used with the best effect by a woman would be different in size from that suited to the deeper notes of a man's voice. The megaphone has succeeded the old speaking trumpet for use at sea and is generally employed by naval officers and mariners for communicating with the shore or with a distant vessel.

MEG'APODE. See MOUND BIRD.

MEG'APOLEN'SIS (Latinized form of *Van Mecelenburg*), JOHANNES (1603–70). The first Protestant missionary to the North American Indians. The first patroon, Van Rensselaer, brought him to America from Holland in 1642, so that he might be a missionary to the Indians on the frontier, near Albany, and in this capacity he antedated John Eliot by several years. He learned to preach in the Mohawk language and made converts among them. He also befriended the heroic Jesuit fathers, Jogues, Bressani, and Poncet. From 1649 till his death, Jan. 24, 1670, he was pastor in New Amsterdam, and it was he who urged Peter Stuyvesant to surrender without bloodshed in 1664. His Dutch account of the Mohawk Indians is translated in the New York Historical Society's *Collections,* vol. iii (New York, 1870).

MEG'ARA (Lat., from Gk. *Μέγαρα*). The capital of Megaris (q.v.), on the isthmus between the Peloponnesus and northern Greece. It was built at the base of two hills, Caria and Alcathous, each defended by a citadel. Two walls, built by the Athenians during their protectorate over Megara, between 461 and 445 B.C., connected the city with its chief harbor, Nisæa. In the time of Pausanias the city contained many temples and public buildings, but of these only very scanty traces are now visible, of which the most interesting are perhaps the remains of the aqueduct and fountain built by the architect Eupalinus for the tyrant Theagenes. The origin of Megara is lost in legend, but as early as the eighth century B.C., thanks to its two harbors, Pegæ on the Corinthian Gulf and Nisæa on the Saronic Gulf, it was a flourishing commercial city and sent out many colonies, of which the most famous were Byzantium, Chalcedon, the Sicilian Megara (see HYBLA), and Selinus (q.v.); to the last-named city colonists came also from the Sicilian Megara. Megara also early had vigorous trade in the region of the Black Sea; its settlements here included Byzantium, Chalcedon, Astacus, Heraclea in Bithynia, and a Heraclea in the Crimea. Near the end of the seventh century we find it engaged in a fierce and protracted struggle with the Athenians for the island of Salamis, of which it long retained possession. From this time, too, it had to face commercial and colonizing competition in the Black Sea district from Miletus, in Sicily from Corinth and Corcyra. The loss of Salamis to Athens in 598 B.C. further crippled Megara. The government had originally been in the hands of the Dorian landed aristocracy, from whom it was usurped about 620 B.C. by Theagenes, who led the popular faction and established himself as absolute ruler of the state. Upon his expulsion, however, soon after, a fierce contest took place between the democratic and the aristocratic parties. After the Persian wars Megara carried on hostilities with Corinth, against which she formed an alliance with Athens (461 B.C.). Athens established a sort of protectorate over the city and built the walls referred to above. Later the Athenians were compelled to surrender their hold on the city, and under a strict oligarchy it became a member of the Peloponnesian League. It was easily open to the attacks of the Athenians and was by the "Megarian decree" of Pericles deprived of all markets in Attica. It was frequently ravaged during the Peloponnesian War and almost captured at one time by the Athenians aided by the democratic party within (424 B.C.); they did secure Nisæa and held it until 410 B.C. After this war the city plays but a small part in history. A democratic form of government was reëstablished in 357 B.C.; after the death of Alexander the Great the city passed under the control of Demetrius Poliorcetes and Ptolemy Soter successively. Demetrius, the son of Antigonus Gonatas, captured and nearly destroyed it. It was afterward partially rebuilt and finally surrendered to the Romans under Metellus. Alone among the cities of Greece it was not restored by Hadrian; Alaric still further reduced it, and in 1687 the Venetians completely destroyed it. Megara was celebrated in antiquity as the seat of the Megarian School of Philosophy, founded by Euclid, a native of the city. (See MEGARIC SCHOOL.) The site is now occupied by a prosperous Greek town, bearing the ancient name, with a population of about 6500, mostly of Albanian origin. Consult F. Cauer, *Parteien und Politiker in Megara und Athen* (Stuttgart, 1890), and K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

MEGAR'IC SCHOOL. A school of Greek philosophers who, as partial disciples of Socrates, expanded one side of their master's teaching. While the Cynic and Cyrenaic schools developed his ethical teaching, the Megaric devoted itself rather to dialectical investigations. Their principal leader was Euclid of Megara, who was probably one of the earliest disciples of Socrates. He united the ethical principle of Socrates with the Eleatic theory of one immutable substance. Consult the standard histories of philosophy, such as those of Ueberweg-Heinze, Ziller, Gomperz.

MEG'ARIS (Lat., from Gk. *Μεγαρίς*). In ancient geography, a district in Greece, covering about 140 square miles, lying between the Corinthian Gulf on the north and northwest and the Saronic Gulf on the southeast (Map: Greece, Ancient, C 2). It was bounded on the north

by Bœotia, on the northeast by Attica, and on the southwest by the District of Corinth. The capital was Megara (q.v.).

MEG'ARON. The large outer hall or atrium of the primitive Greek house, reserved for the men, as at Mycenæ and Tiryns. See HOUSE.

MEG'ASPORAN'GIUM (Neo-Lat., from Gk. *μέγας, megas,* great + *σπόρος, sporos,* seed + *ἀγγεῖον, angeion,* vessel, from *ἄγγος, angos,* jar). The sporangium (spore case) which produces the megaspores (q.v.). Ordinarily the term is applied only among pteridophytes, because the megasporangia of seed plants have long been called ovules, and the older name remains in common use. An obsolete name is macrosporangium. See HETEROSPORY; SPORANGIUM; MEGASPORE.

MEG'ASPORE (from Gk. *μέγας, megas,* great + *σπόρος, sporos,* seed). In some of the pteridophytes and all of the seed plants, two kinds of spores are produced, which differ very much in size, and the larger ones are called megaspores. The significant difference between the two spores, however, is not that of size, but is the fact that the megaspore in germination produces a female plant. It follows that, when plants develop these two kinds of spores (heterospory, q.v.), they have become sexually differentiated. In seed plants the megaspore is not shed from its sporangium (ovule), but germinates where it is formed, and this results in transforming the ovule into the seed. This means that, when spores were differentiated into megaspores and microspores, seeds became possible. An obsolete term for megaspore is macrospore. See ALTERNATION OF GENERATIONS; HETEROSPORY; SPORE.

MEG'ASPOR'OPHYLL (from Gk. *μέγας, megas,* great + *σπόρος, sporos,* seed + *φύλλον, phyllon,* leaf). In some of the pteridophytes and all of the seed plants, two kinds of spores are produced, called microspores and megaspores. These are formed by two kinds of sporangia, called microsporangia and megasporangia, and these in turn are usually borne upon different leaf structures (sporophylls), which are called microsporophylls and megasporophylls. In seed plants the megasporophylls have long been called carpels, which bear the megasporangia, called ovules, which in turn contain the megaspores. An obsolete term for megasporophyll is macrosporophyll. See HETEROSPORY; SPOROPHYLL.

MEGAS'THENES (Lat., from Gk. Μεγασθένης) (fl. c.300 B.C.). A Greek writer of the early Alexandrian period. He was assigned by Seleucus Nicator (312–280 B.C.) to the service of the Governor of Arachosia, by whom he was sent on several diplomatic missions to the Indian King Sandrocottus. He published a work called *Indica* (Ἰνδικά) in four books, in which he discussed the flora and the fauna of India, as well as many of the customs of the Indians. Like Herodotus, Megasthenes admitted wonderful stories into his narrative and tried to identify foreign myths with those of the Greeks. Recent investigations, however, have shown the general trustworthiness of the work, which was the most valuable account of India possessed by Europeans down to the time of the establishment of the Bengal Asiatic Society in 1784. Diodorus (ii, 35–42) gives an abstract of the contents of the *Indica,* and there are numerous fragments in Strabo and Arrian which have been collected by Schwanbeck, *De Megasthene Rerum Indicarum Scriptore* (Bonn, 1845), and by Müller, *Fragmenta Historicorum Græcorum* (Paris, 1841–70), vol. ii, pp. 397–439, and translated by McCrindle, "Ancient India as Described by Megasthenes and Arrian," in the *Indian Antiquary,* vol. vi (Calcutta, 1877). Consult Christ-Schmid, *Geschichte der griechischen Litteratur,* vol. ii (5th ed., Munich, 1911).

MEG'ATHERI'IDÆ (Neo-Lat. nom. pl., from *Megatherium,* from Gk. *μέγας, megas,* great + *θηρίον, thērion,* dim. of *θήρ, thēr,* wild beast). An American family of edentate mammals, of which the genus *Megatherium* is the type, comprising a number of fossil ground sloths of gigantic size. It is intermediate between the modern anteaters (Myrmecophagidæ) and the true sloths (Bradypodidæ) and contains the genera *Hapalops, Hyperleptus,* and others of the Santa Cruz formation of Miocene age in Patagonia, and *Megatherium, Mylodon, Megalonyx,* and *Scelidotherium* of the Pleistocene of North and South America. See MEGATHERIUM.

MEG'ATHE'RIUM (Neo-Lat., from Gk. *μέγας, megas,* great + *θηρίον, thērion,* dim. of *θήρ, thēr,* wild beast). A gigantic fossil edentate mammal, larger than a rhinoceros, which lived in comparatively recent geological time in South America and of which skeletons are found in the pampean deposits (Pleistocene) of Argentina, Chile, and Brazil. Its skeleton, which shows points of resemblance to both the anteaters and sloths, is of very massive construction, indicating a most powerful animal, about 18 to 20 feet in length. The head was small, the jaws of a form to support powerful chewing muscles, and the teeth, of which there are only 10 upper and 8 lower molars, are of a prismatic form and of such size as must have rendered them most effective grinding organs. The structure of the forward portion of the jaws shows the lips to have been elongated and prehensile, and the grooved inside of the lower jaw suggests a powerful prehensile tongue, which served to pull off the twigs and leaves upon which the animal fed. The neck was short and strong, the trunk heavy and round. The leg bones are extraordinarily massive and of peculiar form. The fore limbs are longer than the hind limbs, and the form of their joints indicates considerable flexibility; they probably served somewhat as arms. The very heavy hind-limb bones and the tail bones indicate that the greater portion of the weight of the animal was borne by these parts, and it is reasonable to conclude that the favorite position of the beast was that of resting upon its haunches. The surfaces of the bones are provided with ridges and rough places for the attachment of powerful muscles. The size of the animal, its evidently very great muscular power, and the structure of its hind quarters indicate that it squatted beside a tree and with its mobile fore limbs, the middle fingers of which were armed with strong claws, pulled down and broke off the upper trunk and branches from which it derived its food. The body of the animal is thought to have been covered by tough hide and coarse hair. *Megatherium* was one of the first fossil mammals described. A nearly complete skeleton was found in 1789 near Buenos Aires and sent to the museum of Madrid, where it was described and named by Cuvier, *Megatherium americanus.*

Three other allied genera are *Scelidotherium, Megalonyx,* and *Mylodon,* all of Pleistocene age. Of these, *Scelidotherium,* from South America, closely resembles a gigantic anteater in the struc-

ture of its skull. *Megalonyx*, differing slightly from *Megatherium* in the structure of its teeth, has been found in the cave deposits of Kentucky and Tennessee and in the Pleistocene beds of Cuba. The remaining form, *Mylodon*, remains of which have been found in Kentucky and South America, is the only member of the family Megatheriidæ in which the skin contains calcareous plates similar to those of the other group of gigantic edentates, the Glyptodontidæ; and in *Mylodon* these plates, though numerous, are small and not joined to each other. Consult Woodward, *Outlines of Vertebrate Paleontology* (Cambridge, 1898), and G. B. Scott, *A History of Land Mammals in the Western Hemisphere* (New York, 1913).

MEGENBERG, Konrad von. See Konrad von Megenberg.

MEGERLE, měg′ĕr-le, Ulrich. See Abraham a Santa Clara.

MEGIDDO, me-gĭd′dō. A fortified city of great importance in ancient Syria, situated in the valley of Esdraelon, at the modern Tell el Mutesellim, 4 miles northwest of Tell Ta'annak, as recent excavations have shown (Map: Palestine, C 2). It is mentioned in the reign of Thothmes III (1501–1447 B.C.), in the Amarna letters (c.1400 B.C.), in a papyrus of the time of Seti I (c.1320–1310 B.C.), and in an inscription of Shishak (960–939 B.C.), and is also referred to in Assyrian inscriptions. But the ancient fortifications uncovered by the Deutsche Orientgesellschaft go back to the third millennium B.C. According to Josh. xii. 21 it was the residence of a Canaanitish king at the time of the Hebrew invasion. From Judg. i. 27 it is evident that it did not fall into the hands of the tribes invading the plain. David possibly conquered it, and Solomon fortified it (1 Kings ix. 15). King Ahaziah of Judah found refuge there when fleeing from Jehu of Israel in 843 B.C. (2 Kings ix. 27). Jerome calls the valley of Esdraelon "the Plain of Megiddo." The "waters of Megiddo," mentioned in Judg. v. 19, probably refer to the river Kishon, the present Nahr el Makatta. At Megiddo, King Josiah was overpowered by Pharaoh Necho in 608 B.C. To the south of the *tell* on which the old castle of pre-Israelitish times stood and the inclosing brick wall, 28 feet thick, there is an abundant stream, and in Roman times a fortified post was established here, the Legio of the Onomasticon, the modern El Lejjun. A number of gems and cylindrical texts were discovered at Tell el Mutesellim, among them the oldest-known Hebrew seal, which belonged to Shama, a high official of Jeroboam, probably Jeroboam II (782–740 B.C.). Consult: Müller, *Asien und Europa nach altägyptischen Denkmälern* (Leipzig, 1893); Buhl, *Geographie des alten Palästina* (Freiburg, 1896); Savignac, "Les fouilles de Megiddo," in *Revue Biblique* (Paris, 1907); Schumacher, *Tell el Mutesellim: Bericht über die 1903 bis 1905 veranstalteten Ausgrabungen I* (Leipzig, 1908).

MEG MER′RILIES. A very tall, masculine gypsy woman in Scott's *Guy Mannering*. This character in the dramatized form of the novel was a favorite rôle played by Charlotte Cushman.

MEG′NA, or **MEGHNA.** A deltaic estuary of Bengal, British India, forming the outlet of the Brahmaputra, of the easternmost channel of the Ganges (qq.v.), and of tributary streams. It flows into the Bay of Bengal by four mouths, which inclose three large islands. It is navigable by steamers and large river craft, which, however, are often imperiled by shifting sands and snag and by the tidal bore, which ascends at the rate of 15 miles an hour and often attains over 18 feet in height during the equinoxes; the river is also subject to cyclonic storm waves, which at various times have caused great destruction of property and loss of life.

ME′GRIM. See Migraine.

ME′GRIMS (OF., Fr. *migraine*, It. *migrana*, *emigrana*, from Lat. *hemicranium*, from Gk. ἡμικρανία, *hēmikrania*, pain in one side of the head, from ἡμι-, *hēmi-*, half + κρανίον, *kranion*, head), Congestion of Brain, or Blind Staggers. A disease of the horse. It is indicated by the following symptoms: the animal when at work reels, and then either stands for a minute dull and stupid or falls to the ground, lying for a time partially insensible. The eyes are staring, breathing is hurried and stertorous, and the nostrils are widely dilated. Occasionally these symptoms are followed by coma, convulsions, and death. More frequently, however, the animal gains relief in a little while. The attacks come on suddenly, are often periodical, are most frequent during hot weather, and when the animal is drawing up a hill or exposed during heavy work to the full rays of a hot sun. Liability to megrims constitutes unsoundness and usually depends upon the circulation through the brain being temporarily disturbed. Horses subject to megrims should be used with a well-adjusted collar, with a strap running to the girth to hold down the collar when pulling upgrade, so as to prevent, as much as possible, pressure on the veins carrying the blood from the head; they should be moderately and carefully fed and during hot weather be given plenty of water and an occasional laxative. Consult Leonard Pearson et al., *Special Report on Diseases of the Horse* (Washington, 1911), and James Law, *Text-Book on Veterinary Medicine*, vol. iii (Ithaca, N. Y., 1910–12). See Meningitis, *Cerebrospinal*.

MEHÂDIA, mĕ-hä′dē-ō (Lat. *Ad Mediam*). A small town in the County of Krassó-Szörény, Transylvania, Hungary, situated in the Carpathians, on the Belareka River, 6 miles west of the Rumanian and 15 miles north of the Servian frontier (Map: Hungary, H 4). It is noted for its old cemetery with Greek and Roman inscriptions and for its Roman ruins. In the vicinity are coal mines. Pop., 1911 (commune), 2497, mostly Rumanians. About 3 miles southeast is the bathing resort of Herkulesbad, with numerous hot springs (some of them containing sulphur), ranging in temperature from 106° F. to 143° F. They were known to the Romans as Thermæ Herculis. The place is visited by about 7000 guests annually.

MEHEMET AALI, Pasha, 1815–71. See Aali, Mehemet, Pasha.

MEHEMET ALI, mā′he-mĕt ä′lē (1769–1849). Viceroy of Egypt. He was born in 1769 at Kavala, a little town in Macedonia. Left an orphan, he was taken into the service of a captain of the janizaries. He learned much of military matters and of intrigue, made a rich marriage in 1787, and was thus able to obtain a commission as an officer in the irregular troops of the Sultan. Through relations which he formed with a Marseilles merchant he amassed wealth in trade. He received a command in Egypt to coöperate with the British against the French invaders and at length became commander of the Albanian or Arnaut Corps. In

1805 he was recognized by the Porte as Viceroy of Egypt and Pasha of Three Tails, but was soon involved in disputes with the Mamelukes (q.v.), who had long practically ruled Egypt. The struggle was finally terminated in 1811 by the massacre of the greater number of these at Cairo. The rest fled to Upper Egypt, but were expelled by Mehemet in the following year. They then took refuge in Nubia, but in 1820 he followed them there and completely vanquished them. From 1811 to 1818 he carried on war against the Wahabis in Arabia, who were subjugated by his adopted son, Ibrahim Pasha. Shortly after he conquered Kordofan, added it to his dominions, and opened a great trade in slaves from the interior of Africa. About this time he began to reorganize his army on something like European principles, built a fleet, and erected fortresses, military-shop works, and arsenals. He sent a strong force to assist the Sultan in suppressing the Greek revolt in 1824, but his new fleet was destroyed at Navarino in 1827. In 1830 the Porte conferred on him the Government of Crete, but this did not satisfy his ambition. He determined to annex Syria to his dominions and in 1831 dispatched an army under Ibrahim Pasha, who overran the country, defeating the Turks at Horas, July, 1832, and by his victory at Konieh (Dec. 20, 1832) brought the Turkish government to the brink of ruin. Russia now stepped in, and a treaty was concluded (May 4, 1833) by which Syria was handed over to Mehemet. Neither of the belligerents was satisfied, and Mehemet continued to plot till Sultan Mahmud II declared war in 1839 against his dangerous subject. At Nisib, June 24, 1839, the Turkish army was crushed by the forces of Mehemet Ali, but the European Powers again interfered, and Mehemet was compelled to give up Syria and Crete and to content himself with the hereditary viceroyalty of Egypt (1841). Mehemet was at once a remorseless tyrant and an able, progressive administrator and did much to develop Egypt. He cleared his dominions of robbers, executed great public works, and may be said almost to have introduced the cultivation of cotton, indigo, and sugar into the country. He also established a system of national education in Egypt. He died Aug. 2, 1849.

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MEHEMET ALI PASHA, på-shä′ (1827–78). A Turkish soldier. He was born in Magdeburg, Prussia, and his name originally was Karl Detroit. In 1843 he ran away to sea and embarked for Turkey. Aali Pasha, later Grand Vizier, took an interest in him and in 1846 sent him to a military school. He embraced Mohammedanism, received a commission in the Ottoman army in 1853, and fought against Russia in the Crimean War. In 1865 he was made a brigadier general and Pasha, in 1875–76 he commanded in Bosnia, and in the war of 1877–78 against Russia he was at the head of the Turkish army in Bulgaria. He was successful in his operations on the river Lom (August–September, 1877), but was afterward forced back by the enemy. He failed to effect a junction with Suleiman Pasha and was superseded by the latter (1878). He was second plenipotentiary at the Berlin Congress, and on his return was sent to Albania, where he was mobbed and killed by insurgents at Diakova, Sept. 7, 1878.

MEHER′RIN. A small tribe of Iroquoian stock, formerly living on the lower course of the river of the same name, on the Virginia-Carolina border. They made some trouble during the Tuscarora War of 1711–12, but soon afterward disappear from notice, having apparently been absorbed by that tribe or by the Tutelo. See CONESTOGA.

MEHRING, mā′rĭng, FRANZ (1846–). A German writer, especially on Socialism. He was born in Schlawe, Pomerania, and became an editor of *Die Neue Zeit*. He wrote *Fall Lindau* (1890), *Lessing-Legende* (1893), *Gustav Adolf* (1894), *Schiller* (1905), and *Jena und Tilsit* (1906); but he is better known for his valuable work on German Socialism, partly in German periodicals and partly in his books *Die deutsche Sozialdemokratie* (3d ed., 1879), *Geschichte der deutschen Sozialdemocratie* (1897), *Aus dem literarischen Nachlass von Karl Marx, Friedrich Engels, und Ferdinand Lassalle* (1902), and *Sozialistische Neudrucke* (1908 et seq.), writings of Engel, Weitling, Wolff, and Lange.

MÉHUL, mā′ụl′, ETIENNE NICHOLAS (1763–1817). A French operatic composer, born at Givet. At the age of 10 he was organist of his native village; in 1778 he went to Paris, where he gained the interest of Gluck. After several unsuccessful efforts in composition his *Euphrosine et Corradin* finally achieved fame (1790), and other compositions previously written were then brought to light. *Stratonice* appeared in 1792; and this was followed by patriotic national hymns for the Army of the Republic, entitled "Le chant du départ," "Le chant de victoire," "Le chant du retour," which won him high popularity. Other works appeared in rapid succession; in 1806 *Uthal;* previously, *Une folie, ou les aveugles de Tolède* (1802); and in 1807 *Joseph,* his most esteemed composition. In 1795 he was elected a member of the Academy, and also appointed an inspector of the Conservatory, which had but recently been established. His works comprise every form of music, but it is wholly by his operas that he is known to fame. They are marked by dramatic truth, noble melodies, and, though his work constantly shows a lack of thorough training, he was one of the first French composers adequately to express the meaning of the words in music. Consult A. Pougin, *Biographie* (Paris, 1889), and R. Brancour, *Méhul* (ib., 1912).

MEI, mā, or **MAY,** LEV ALEXANDROVITCH (1822–62). A Russian poet. He was born in Moscow and was educated at the Institute of Tsarskoi Selo. He attracted a great deal of attention by his drama *Tsarskya Nevĕsta* (The Bride of the Czar) (1849), which was followed by the dramas *Servilia* and *Pskovitianka* (The Woman of Pskov). Besides publishing several minor poems on classical and biblical themes, he also considerably enriched Russian literature by his translations from Milton, Byron, Schiller (*Wallensteins Lager* and *Demetrius*), Goethe, Heine, Béranger, Victor

Hugo, and others. His works were published at St. Petersburg (1862–63).

MEIBOM, mī'bŏm, Victor von (1821–92). A German jurist, born at Cassel. He studied law at Marburg and Berlin, and was for several years assistant judge at tribunals of Rotenburg and Marburg. In 1858 he was appointed professor of German law at the University of Rostock, and from 1866 to 1873 held a similar appointment at Tübingen. He then went to Bonn, where he remained till 1875, when he became a member of the Supreme Court of the Empire in Leipzig. He retired in 1887. His chief work is *Das deutsche Pfandrecht* (1867), a thorough and historically reliable discussion of the laws and regulations relating to mortgage before the introduction of Roman law.

MEIDERICH, mī'dĕr-ĭk. An industrial town in the Rhine Province, Prussia, between the Emscher and the Ruhr, 15 miles northeast of Krefeld (Map: Germany, B 3). It contains the Rhine Steel Works, employing 4300 men, and a number of other iron and steel works, machine shops, phosphate works, saw mills, and brick-kilns. In the vicinity are extensive coal mines and saline springs. The trade in cattle is important. The industries date from 1850. Meiderich became a town in 1894 and was annexed to Duisburg in 1905. Pop., 1900, 33,684; 1910, 41,017.

MEIER, mī'ĕr, Edward Daniel (1841–1914). An American mechanical engineer, born in St. Louis, where he graduated from Washington University in 1858. After spending four years at the Royal Polytechnic College at Hanover, Germany, he returned to the United States and enlisted in the 32d Pennsylvania Volunteers in 1863. After the battle of Gettysburg he served in the artillery and in the Engineer Corps, and finally became a lieutenant of cavalry. At the close of the war he entered the Rogers Locomotive Works at Paterson, N. J., in 1867 became superintendent of machinery of the Kansas Pacific Railroad, in 1870 chief engineer of the Illinois Patent Coke Company, and in 1872 constructing engineer of the Meier Iron Company. In 1884 he organized the Heine Safety Boiler Company of St. Louis, of which he was president at the time of his death; and he was also the head until 1908 of the American Diesel Engine Company. Meier served as president of the American Boiler Manufacturers' Association, of the Machinery and Metal Trades Association in 1908–14, and of the American Society of Mechanical Engineers in 1911.

MEIER, Moritz Hermann Eduard (1796–1855). A German classical scholar, born at Glogau. When 24 years of age he became professor extraordinarius at the University of Greifswald, and in 1824 he was made professor ordinarius at Halle, where he remained until his death. Friedrich August Wolf, and especially Wolf's great pupil, August Boeckh, whose classic work on the public economy of Athens appeared in 1817, had a great influence on Meier. His own first important publication dealt with a question in the legal antiquities of Athens, *Historia Juris Attici de Bonis Damnatorum, etc.* (Berlin, 1819); but his greatest work was written in collaboration with G. F. Schoemann, *Der Attische Process* (Berlin, 1824), and was crowned by the Berlin Royal Academy. This treatise, now revised by J. H. Lipsius (Berlin, 1883–87), remains the standard work on Athenian legal procedure. Meier also prepared an edition of Demosthenes, *Against Meidias*, and published many papers on subjects relating to classical antiquity, especially Andocides and Theophrastus; these were collected after his death in *Opuscula* (1861–63). Much of his energy, however, while resident at Halle, was spent on editorial duties, as he was an editor of the Halle *Allgemeine Zeitung* for many years, and also coeditor of the *Allgemeine Encyclopädie der Wissenschaften und Künste* from 1830 to 1855.

MEIGGS, mĕgz, Henry (1811–77). An American contractor. He was born at Catskill, N. Y., was engaged in the lumber business in 1835, and failed in the commercial crisis of 1837. It was not until the outbreak of the gold excitement in California that he again became prosperous. He then shipped lumber in large quantities to the Pacific coast, and his trade so increased that he was encouraged to build a large number of vessels. At length a financial stringency in the San Francisco money market drove him to borrowing, and eventually, his business collapsing, he fled to South America. He settled in Chile and entered into the business of bridge-building contractor. Later he devoted himself to railroad construction, and in Peru accomplished engineering works which are objects of general admiration. He made contracts for the construction of six railroads in that country, one of which, the Callao, Lima, and Oroya Railroad, over the Andes, ranks among the first public works of the kind in the world.

MEIGS, Fort. See Fort Meigs.

MEIGS, Charles Delucena (1792–1869). An American physician. Born in St. George, Bermuda, he studied medicine at the University of Georgia, graduating in 1809, and later at the University of Pennsylvania (M.D., 1817). For a short time he practiced in Augusta, Ga., but in 1817 established himself in Philadelphia and soon gained recognition as an obstetrician. From 1841 to 1861 he held the chair of obstetrics and diseases of women and children at the Jefferson Medical College. In 1826 he assisted in founding the *North American Medical and Surgical Journal*, being one of the original editors. He contributed many articles to medical literature, and is the author of *The Philadelphia Practice of Midwifery* (1838; 2d ed., 1842); *Lectures on Some of the Distinctive Characteristics of the Female* (1847); *Females and their Diseases* (1848; 2d ed., as *Woman: Her Diseases and Remedies*, 1851; 3d ed., 1854); *Remarks on Spasmodic Cholera* (1849); *Obstetrics* (1849; 3d ed., 1856); *Observations on Certain Diseases of Children* (1850); *Treatise on Acute and Chronic Diseases of the Neck of the Uterus* (1854); *On the Nature, Signs, and Treatment of Childbed Fevers* (1854). He translated Hufeland, *A Treatise on the Scrofulous Disease* (1829); Velpeau, *An Elementary Treatise on Midwifery* (1831); Colombat de L'Isère, *A Treatise on the Diseases and Special Hygiene of Females* (1845). Consult College of Physicians, Philadelphia, *Transactions*, N. S., vol. iv, pp. 417–448 (Philadelphia, 1872); John F. Meigs, *Memoir of Charles D. Meigs* (ib., 1872).

MEIGS, Montgomery Cunningham (1816–92). An American soldier and military engineer. He was born in Augusta, Ga., studied for a short time at the University of Pennsylvania, graduated at West Point in 1836, and immediately afterward became second lieutenant in an artillery company. In 1837 he was trans-

ferred to the Corps of Engineers, in which he became a lieutenant in 1838 and captain in 1853. From 1836 to 1852 he was employed by the War Department on various important engineering works. Between 1852 and 1860 he superintended the construction of the Potomac Aqueduct from the Great Falls in Maryland to Washington, D. C., the erection of the Capitol extension in Washington, the Post Office extension, and the great iron dome of the Capitol. In the winter of 1860–61 he was engaged in placing Fort Jefferson, Fla., in a condition for defense, and in April, 1861, organized and conducted the Fort Pickens relief expedition. On May 15 he was appointed Quartermaster-General of the United States army, with the rank of brigadier general. In this important position he had the direction of the supply and equipment of the United States forces in the field during the continuance of the war. Though generally stationed at Washington, he frequently made personal inspections of the quartermaster's departments of the various armies during siege and field operations. On July 5, 1864, he was brevetted major general for "distinguished and meritorious services during the Rebellion." After the war until his retirement in 1882 he was a member of many important boards and commissions in connection with the War Department. After his retirement until 1887 he was employed as architect on the construction of the United States Pension Bureau Building in Washington. The historian Rhodes has grouped him with Stanton, Dana, and Fry, who, he says, "may challenge comparison with any administrators for honesty and efficiency."

MEIGS, Return Jonathan (1734–1823). An American soldier and pioneer, born in Middletown, Conn. He joined the Continental troops before Boston shortly after the battle of Lexington, and later in the same year, as a major of militia, accompanied Benedict Arnold on the latter's expedition against Quebec. During the assault on that city he was made prisoner, but was exchanged the following year. He became a colonel in 1777, defeating in May of that year the British at Sag Harbor, L. I.; he also participated in Anthony Wayne's storming of Stony Point in 1779. After the close of the war he became interested in schemes of Western colonization, was one of the promoters of the Ohio Company, and crossed the Alleghanies himself in 1788 to settle at Marietta, Ohio. Later he was interested in the Muskingum settlement, and is said to have devised for emigrants a code of rules which was fastened to a tree at the junction of the Ohio and Muskingum rivers. In 1794 he was commissary general of the troops in General Wayne's expedition against the Indians, and distinguished himself at the battle of Fallen Timbers. In 1801 he was appointed Indian agent, and took charge of the Cherokee agency in Georgia, where he remained until his death. His *Journal of the Expedition to Quebec*, first printed in the *American Remembrancer*, was published in 1864.

MEIGS, Return Jonathan (1765–1825). An American politician, born in Middletown, Conn., son of Return Jonathan Meigs, the elder. He graduated at Yale in 1785 and studied law. In 1788 he removed with his father to Ohio Territory, and from 1803 to 1804 was Chief Justice of the State. He was judge of the United States Court for Michigan Territory in 1807 and 1808; served as Democratic United States Senator from Ohio in 1808–10; and from 1810 to 1814 was Governor of Ohio. His services during the War of 1812 were particularly efficient in organizing militia and supplying garrisons to the forts. In 1814 he was appointed Postmaster-General by President Madison, and he was continued in this office until 1823 by President Monroe.

MEIJI TENNO, mā′ē-jē tĕn′nō (1852–1912). The posthumous name of an emperor of Japan; during life he was known in Europe and America as Mutsuhito (gentleman), but in Japan he was called by the common people Tenshi Sama (august son of heaven) and by the educated class Shu-jo (supreme master). He was born Nov. 3, 1852, in the mountains of Kyoto, and was the one hundred and twenty-first of his line. His education, liberal as measured by the standards of the time, was supervised by his mother, who had been a lady of the Imperial household. He succeeded his father, Osahito, in 1867, but was not crowned (at Osaka) until Oct. 31, 1868. Immediately, in order to carry out a purpose of concentrating power in the hands of the Emperor himself, the capital was moved from Kyoto to Yeddo, and the city renamed Tokyo. The next year Mutsuhito returned to Kyoto and took as his consort Haruko (died 1914), a princess of the house of Ichijo. During a reign of 45 years he did much to promote the progress of his country, his biography being merged in the history of the New Japan. Largely through his exertions Japan was freed from the restraints of centuries and took her place among the great powers of the world, after triumphing over China and Russia. The Emperor was the first constitutional monarch in the Far East; as an administrator he is generally held to have been very successful, although opinions differ as to his activity in later years. He followed a policy of trusting state affairs in large measure to such loyal advisers as Iwakura, Kido, Okubo, and Ito. A lover of books and the collector of a large library of Japanese and Chinese classics, he was also one of the notable writers of verse of his time and country. It is said that he composed 38,000 poems of five lines or *tanka*. He died July 29, 1912, and was succeeded by his son Yoshihito (q.v.). For an account of the events of his reign, see Japan, *History*. Consult J. H. Longford, *The Evolution of New Japan* (New York, 1913), and the bibliography under Japan.

MEIKLEJOHN, mĭk″l-jŏn, Alexander (1872–). An American college president. He was born at Rochdale, Eng.; came to America in 1880; and was educated at Brown University (A.B., 1893; A.M., 1895) and at Cornell (Ph.D., 1897). In the latter year he returned to Brown as a member of the department of philosophy—instructor (1897–99), assistant professor (1899–1903), and associate professor (1903–06). From 1906 to 1912 he was professor of logic and metaphysics and from 1901 to 1912 he was dean. In 1912 he was called to the presidency of Amherst College.

MEIKTILA, mĭk-tē′lä. A division of southeast Upper Burma, comprising the districts of Meiktila, Kyauske, Myingyan, and Yamethin (Map: Burma, C 2). Area, 10,852 square miles. Pop., 1901, 992,807; 1911, 1,170,502. Capital, Meiktila.

MEILHAC, mā′yȧk′, Henri (1831–97). A French dramatist, who worked chiefly in collaboration with Ludovic Halévy (q.v.). He was born Feb. 23, 1831, in Paris, where he studied

at the Lycée Louis-le-Grand. From working in a book shop he turned to writing for the stage. *Satania* and *Garde-toi, je me garde* pleased the critics, who discerned Meilhac's cleverness and technical knowledge. He succeeded not only in vaudeville, but in higher and more delicate comedy. It is, however, impossible to tell what belongs to Meilhac and what to Halévy, so well did these two men blend their genius. Meilhac and Halévy excelled in operetta and opera bouffe, as well as in more dramatic, less musical composition. Together they wrote *Frou-frou*, and the librettos of *La belle Hélène* and *La grande duchesse* for Offenbach's music. Of Meilhac's work before 1861 *La vertu de Célimène* is most significant; of that after 1881, *Décoré* (1888) and *Grasse fortune* (1896). He was made a member of the French Academy in 1888 and died in Paris, July 6, 1897.

MEILI, mē′lē, Friedrich (1848–1914). A Swiss authority on international law, born at Hinwil, Canton of Zurich. He was educated at the universities of Zurich, Leipzig, and Berlin and at the Ecole de Droit of Paris; practiced law from 1871 to 1895; and became docent (1880), professor extraordinary (1885), and regular professor (1890) of private international law in the University of Zurich. He retired in 1913. He was one of the jurists who made awards in the Swiss national railway cases, including the St. Gotthard railway (1910), and one of the three arbitrators in the Lourenço Marques railway case between Portugal and Great Britain (1900); was employed by the Russian Imperial government in the Hillfeld case on the pawning of Russian titles in Berlin and by the Austrian ministry of commerce in planning a new patent code; and represented Switzerland in The Hague conferences on private international law (1893, 1894, 1900, and 1904). Among his important works, dealing particularly with the law of transportation, are: *Das Telegraphenrecht* (2d ed., 1873); *Das internationale Zivil- und Handels-Recht* (2 vols., 1902; in English, 1905); *Das internationale Zivilprozessrecht* (1904–06); *Die Kodification des Automobilrechts* (1907); *Die drahtlose Telegraphie* (1908); *Privat- und Zivil-Prozessrecht auf Grund der Haager Konventionen* (1911), with Mamelik.

MEILLET, mā′yā′, Antoine (1866–). A distinguished French philologist, born at Moulins-sur-Allier and educated at the universities of Paris and Vienna. He was maître de conférences at the Paris Ecole des Hautes Etudes in 1891 and became professor of Armenian at the School of Oriental Languages in 1903. In 1906 he was elected to the chair of Slavic in the Collège de France. For his linguistic work he received an honorary degree from the University of Berlin, and was elected corresponding member of a number of academies, among them that of St. Petersburg. He published: *Recherches sur l'emploi du génitif-accusatif du vieux slave* (1897); *Grammaire comparée de l'arménien* (1903); *Introduction à l'étude comparative des langues indo-européennes* (1903; 3d ed., 1912; Ger. trans., 1909, by Printz); *Dialectes indo-européens* (1908), in which, like Kretschmer, he attempts to trace the Indo-European subfamilies back to early dialectical differences; *Aperçu d'une histoire de la langue grecque* (1913), a brilliant work of revolutionary character, which restores the written language to its position of paramount importance; *Altarmenisches Elementarbuch* (1913); and studies of old Slavic. In 1902 a volume of *Mélanges linguistiques*, made up of contributions by his numerous pupils, was prepared in his honor.

MEILLEUR, mā′yĕr′, Jean Baptiste (1795–1878). A Canadian author and educator. He was born at St. Laurent, near Montreal, Province of Quebec, and was educated at the College of St. Sulpice, Montreal. He studied law, but left it for the medical profession and in 1825 graduated at the Carleton Medical College in Vermont. He returned to Lower Canada, did editorial work for the *Tessier Journal*, and in 1834 was elected a member of the Lower Canada Legislative Assembly. He was appointed Superintendent of Public Instruction by Sir Charles Bagot in 1842, and held that position for 15 years, during which time 45 educational institutions were established, largely through his efforts. In 1862 he was appointed postmaster of Montreal. He was one of the founders of L'Assomption College. He published in French several textbooks on chemistry, grammar, and education.

MEINEKE, mī′ne-ke, Johann Albrecht Friedrich August (1790–1870). A distinguished German classical scholar. He was born at Soest in Westphalia and was educated at Leipzig, especially under G. Hermann. He was director of the Gymnasium at Danzig (1817–26) and of the Joachimsthal Gymnasium at Berlin (1826–57). His many works, chiefly critical editions of the Greek authors, include: *Fragmenta Comicorum Græcorum*, three volumes, with an introductory volume giving a "Critical History of the Greek Comic Poets" (1839–43; a fifth volume came in 1857); *Analecta Alexandrina* (1843), containing collections and admirable explanations of the fragments of Euphorion, Rhianos, Alexander Ætolus, and others; and text recensions of Strabo (1852–53); of Horace (1834), in which the so-called four-line strophe law, discovered by Meineke and Lachmann, is applied; of Stobæus (1855–64); of Athenæus (1859); and of Aristophanes (1860). Consult: F. Ranke, *Albert Meineke* (Leipzig, 1871); H. Sauppe, *Zur Erinnerung an Meineke und Bekker* (Göttingen, 1872); E. Förstemann, in *Allgemeine deutsche Biographie*, vol. xxi (Leipzig, 1885); J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

MEINHOF, mīn′hōf, Carl (Friedrich Michael) (c.1857–). A German philologist, noted for his knowledge of African languages. He was born in Barzwitz, Pomerania, the son of a clergyman; was educated at Halle, Erlangen, and Greifswald; in 1879–86 was a school-teacher in Wolgast and Stettin; and then became pastor at Zizow in Pomerania. In 1902–03 he traveled in Africa to make linguistic studies. He then taught African languages in the Berlin Seminary for Oriental languages until 1909, when he was made professor of the same subject in the Hamburg Colonial Institute. Meinhof edited the *Abhandlungen* of this institute and the *Zeitschrift für Kolonialsprachen*. Among his valuable works are: *Grundriss einer Lautlehre der Bantusprachen* (1899; 2d ed., 1910); *Grundzüge einer vergleichenden Grammatik der Bantusprachen* (1906); *Deutsche Kolonialsprachen: Herero, Swahili, und Duala* (1909–12); *Die Sprachen des dunkeln Weltteils* (1909); *Lehrbuch der Namasprache* (1909); *Moderne Sprachforschung in Afrika* (1910);

Dichtung der Afrikaner (1911); *Afrikanische Religionen* (1912); *Die Sprache der Hamiten* (1912). *An Introduction to the Study of African Languages*, translated by A. Werner, appeared in 1915.

MEINHOLD, mīn'hōlt, JOHANNES (1861–). A German Old Testament scholar. He was born in Kammin; studied theology in Leipzig, Berlin, Greifswald, and Tübingen; taught at Greifswald (1888) and after 1889 at Bonn, where he became professor of Old Testament exegesis and Hebrew in 1903. Among his published works are: *Komposition des Buches Daniel* (1884); *Beiträge zur Erklärung des Buches Daniel* (1888); *Die geschichtlichen Hagiographen und das Buch Daniel* (1889), with Ottli; *Jesus und das alte Testament* (1896); *Jesaja und seine Zeit* (1898); *Die Lade Jahves* (1900–01); *Biblische Urgeschichte* (1904); *Sabbat und Woche* (1905); *Weisheit Israels* (1908); *Sabbat und Sonntag* (1909); *Der Mischnatraktat Ioma* (1913).

MEININGEN, mī'nĭng-en. The capital of the little Duchy of Saxe-Meiningen, Germany, 40 miles south of Eisenach, on the right bank of the Werra (Map: Germany, D 3). Since a fire in 1874 it has been largely rebuilt on a modern plan, but there still remain the eleventh-century parish church and the seventeenth-century ducal palace, now the home of the Henneberg Antiquarian Society. Its collections include coins, paintings, and a library of 50,000 volumes. Modern buildings include two ducal palaces and a town hall. It has manufactures of machinery, toys, books, and there are railway shops. The Meiningen stock company, which for 16 years enjoyed a European reputation for the excellence of its staging and acting, was dissolved in 1890. Pop., 1910, 17,131.

MEINONG, mīn'ŏng, ALEXIUS, KNIGHT VON HANDSCHUCHSHEIM (1853–). An Austrian psychologist and philosopher, born in Lemberg and educated in Vienna under Brentano. From Vienna he went in 1882 as professor to the University of Graz, where he established in 1894 the first psychological institute in Austria. Among his important publications are: *Hume-Studien* (1877–82), devoted especially to Hume's nominalism, and supplemented by many articles in periodicals; *Ueber philosophische Wissenschaft und ihre Propädeutik* (1885); *Psychologisch-ethische Untersuchung zur Werttheorie* (1894) —like Ehrenfels basing a theory of value on psychological grounds; *Ueber Annahmen* (1902; 2d ed., 1910), in which he frames a sort of transcendental realism with a "Gegenstandstheorie" of ideal objects or objects of a higher order; *Ueber die Stellung der Gegenstandstheorie im System der Wissenschaften* (1907); *Gesammelte Abhandlungen* (3 vols., 1913–14). For his psychological interpretation of Weber's Law, see WEBER'S LAW. Consult the excellent article on Meinong in Eisler's *Philosophen-Lexikon* (Berlin, 1912).

MEISSEN, mī'sen. An old town of the Kingdom of Saxony, Germany, on both sides of the Elbe, 16 miles by rail northwest of Dresden (Map: Germany, E 3). The old town is situated on the left bank opposite the more modern quarters on the right bank. Above it rises the Schlossberg (160 feet), with the cathedral and the Albrechtsburg. The cathedral, a masterpiece of Gothic architecture, was erected in 1260–1450. It is surmounted by a fine spire of openwork, contains many monuments and tombs of Saxon rulers, and a notable altarpiece by an unknown German painter. There are numerous other old churches. The Albrechtsburg, an excellent late Gothic castle, erected in 1471–83 and occupied by the royal porcelain factory from 1710 to 1864, has been restored since 1873, and some of the halls have been decorated with fine frescoes by modern artists. The most noteworthy educational institution is the Fürstenschule on the Afraberg, founded in 1543. Lessing and Gellert attended school here. There are also a fifteenth-century council hall, a Realschule, and schools of commerce, agriculture, and navigation.

Meissen has played a prominent part in the porcelain industry of Saxony. It was here that Böttger established in 1710 the first porcelain factory in Europe and produced the famous Meissen ware. (See BÖTTGER; POTTERY.) The factory was transferred in 1863 from the Albrechtsburg to Triebischthal, a short distance from Meissen, and now employs over 700 persons. Meissen has a number of other porcelain manufactories, also foundries and machine works, and manufactures of stoves, gunny, tin goods, shoes, lamps, chemicals, sugar, bricks, sewing machines, pianos, and furniture. There are large granite quarries and vineyards. The chief articles of commerce are local manufactures and wine.

Meissen was founded in 928 by the Emperor Henry I, and rose to great importance as the residence of the margraves of Meissen, the direct ancestors of the present royal house of Saxony. The bishops of Meissen had until 1581 the rank of princes of the Empire. Pop., 1900 (including Cölln, annexed in 1901), 20,123; 1910, 33,884, chiefly Protestants.

MEISSEN, HEINRICH VON. A German minnesinger. See FRAUENLOB.

MEISSNER, mīs'nĕr, ALFRED (1822–85). An Austrian poet, born at Teplitz, grandson of the following. His *Gedichte* (1845; 12th ed., 1880) attracted much attention, and the lyrical epic *Ziska* (1846; 2d ed., 1884) shows the influence of Byron, George Sand, and Lenau. During a stay in Paris he wrote his *Revolutionäre Studien aus Paris* (1849). His tragedies, *Das Weib des Urias* (1850) and *Reginald Armstrong, oder die Welt des Geldes* (1853), were not very successful. Better are his novels, chief among which are: *Sansara* (1861); *Neuer Adel* (1861); *Zur Ehre Gottes.* The last named is an interesting narrative of the events which took place in Austria during the reactionary period of 1850-54. His *Heine-Erinnerungen* (Hamburg, 1856) is also important. Consult his autobiography, *Geschichte meines Lebens* (Teschen, 1884), and Ernst Ziel, *Litterarische Reliefs* (Leipzig, 1895).

MEISSNER, AUGUST GOTTLIEB (1753–1807). A German miscellaneous writer, born at Bautzen. He studied law at Wittenberg and Leipzig, and in 1785 was appointed to the chair of belles-lettres in the University of Prague. For the last two years of his life he was director of the Fulda Gymnasium. Best known of his works are his *Skizzen*, a collection of miscellaneous stories, dialogues, anecdotes, and essays. He also wrote several historical novels, such as *Alcibiades* (1781–88); *Bianca Capello* (1785); *Epaminondas* (1798). His complete works were published in fifty-six volumes (Vienna, 1811–12). Consult R. Fürst, *A. G. Meissners Leben und Schriften* (Stuttgart, 1894).

MEISSONIER, mā'sō'nyā', JEAN LOUIS ERNEST (1815–91). A French military and genre

JEAN ERNEST MEISSONIER

"FRIEDLAND, 1807," FROM THE PAINTING IN THE METROPOLITAN MUSEUM, NEW YORK

painter. He was born at Lyons, Feb. 21, 1815. In 1830 he went to Paris and worked for a short time in the studio of Cogniet, but he received his most valuable training in art from his study of the old masters in the Louvre, especially those of the Dutch school. At first he illustrated books and made etchings as a means of livelihood. His first painting, "The Visitors," was exhibited at the Salon in 1834. In 1843 and 1848 he received first-class medals from the Salon, and in the expositions of 1855, 1867, and 1878 the Grand Medal of Honor. In 1848 he was captain of artillery in the National Guard. He was with Napoleon III at Solferino in 1859, and during the siege of Paris in 1870 he was lieutenant colonel of infantry in the National Guard. He received the cross of the Legion of Honor in 1846 and the Grand Cross in 1889; was chosen a member of the Institute of France in 1861 and president in 1876 and 1891. He died in Paris, Jan. 31, 1891.

His subjects are historical, military, and scenes from everyday life. Most of his pictures are on small canvases and studies of one or two figures. The characters are almost entirely men; in very few of his pictures do women or children appear. He was the chief of a school of genre painters, among the most prominent of whom were his son, Jean Charles, Detaille (q.v.), and Vibert (q.v.). Every detail is as faithfully and carefully studied and portrayed as if it were of sole importance, and sometimes, particularly in his larger pictures, to the detriment of the general effect. His drawing is masterly, the color is fresh and true, and the light and shade excellent; but his paintings usually lack beauty of tone, and their bald realism precludes real inspiration. He excels in the portrayal of action, and in his power to depict the subtlest shades of expression on the faces of his characters. Of his military pictures one of the most famous is "Friedland, 1807" (1875), a large painting in the Metropolitan Museum, New York. Other famous military pictures are: "Cavalry Charge" (1867); "Napoleon III at Solferino" (1864), in the Louvre; "The Retreat from Moscow"; "Napoleon Overlooking a Battle"; "Napoleon and his Staff in 1814" (1864, Louvre). The Metropolitan Museum of Art, New York (inclusive of the Vanderbilt collection), possesses 12 other paintings by Meissonier and he is excellently represented in the Louvre and in the Wallace collection, London. Among his best-known genre pictures are: "The Quarrel" (1855), belonging to the King of England; "Ball Players at Antibes"; "Amateurs of Painting" (1843, Musée Condé, Chantilly); "The Halt" (1869); "The Chess Players" (1834); "Throwing Dice" (1836); "Man Reading," "Man at a Window," and "The Voyage" (Louvre); "The Farrier" (1861); "The Barricade." He also designed for lithography and was an etcher of note. For his biography, consult: Jules Claretie (Paris, 1884); Larroumet (ib., 1893); Gréard (ib., 1897); Fromentin (ib., 1901); Robinson, in the *Art Annual* (London, 1887); in *Masters in Art*, vol. v (Boston, 1904).

MEISSONIER, Juste Aurèle (1695–1750). A French decorative designer and goldsmith whose work was unexcelled for originality and in style constitutes the best and most complete definition of rococo. (See Interior Decoration.) He was appointed by Louis XV to a court position of draftsman, and he published many illustrated books on ornament, engraved mostly by Huquier. Some of his designs are accessible in T. A. Strange, *French Interiors, Furniture, etc.* (London, 1907).

MEISTER, mī'stēr, Richard (1848–1912). A German classical scholar, born in Dresden, where his father was regisseur at the Court Theatre. He was educated at Leipzig (under Curtius, Ritschl, and Overbeck) and at Berlin. In 1872 he became a teacher in the Leipzig Nikolaischule, of which he was Konrektor for the last 12 years of his life. In the fourth volume of Curtius' *Studien zur griechischen und lateinischen Grammatik* (1871) appeared Meister's work on the dialect of Heraclea. He revised Ahrens's *De Græcæ Linguæ Dialectis* (1839–43) in two volumes as *Die griechischen Dialekte* (1882–89), which was supplemented by *Zum eleischen, arkadischen, und kyprischen Dialekte* (1890) and by his "Beiträge zur griechischen Epigraphik und Dialektologie," in *Berichte der kgl. sächs. Gesellschaft der Wiss.* (1899–1911).

MEISTERSINGER, mīs'tēr-sĭng-ēr. The name given to those poets and poetasters who, succeeding the minnesingers (q.v.), gradually deteriorated into very inferior rhymesters, who organized themselves into schools according to trade guilds and who produced an immense number of master songs, almost wholly doggerel. Hans Sachs (q.v.) was the best of them all. The word "meister" (derived, like English "master," from Latin *magister*) means a poet who has studied, as all laymen did, in Church schools. Accordingly the meistersingers were distinguished from the common minstrels. They also formed a guild or caste. The meistersingers were wont to trace their origin back to "the 12 old masters." Various legends arose, explanatory of their origin. One Spangenberg even thought Moses was a meistersinger. David, also, was looked upon as a patron in whose time hundreds of meisters were supposed to have taught 4000 scholars, and Solomon also was reckoned in. Furthermore, the minnesingers were reckoned as members of their caste, but, as a matter of fact, they were different in many ways. Individual meistersingers out of modesty called themselves "lovers of art" (*Liebhaber der Kunst*), and the whole body of them named themselves the "honorable" or "praiseworthy society." We may suppose that associations existed as early as 1200. Heinrich von Meissen, called Frauenlob, may have had a school of song at Mainz. We cannot be sure of a regular school till 1450 in Augsburg. But the meistergesang had flourished in the fourteenth century at Mainz, Strassburg, Colmar, and Frankfort; in the fifteenth and sixteenth at Nuremberg; later still it flourished in Breslau, Görlitz, and Danzig. In 1492 Strassburg had the first school founded by written statutes, and Nuremberg had what became, thanks to Richard Wagner, best known to this generation. The last school died out at Memmingen in 1844.

Each school had for the head meistersinger a chair called *der Künste Stuhl* (chair of the arts), or, as in Nuremberg, the *Meisterstuhl* (master's chair). In England this was called "the bard's seat." Later the singer seems simply to have stood in the midst of his hearers. To enter the guild a candidate had to pass an examination before four markers, usually in a church. He must devise some new arrangement or a new melody (*Weise*) without infringing any rule. One of the markers determined

whether the theme was right, another whether the versification was right, and the others looked to rhyme and melody. One need hardly add that, in a school whose whole attention was given to technicalities, the possible mistakes were limited by set rules. The success of a meistergesang hung upon its conformity with these rules. Indeed, the very essence became a formula or a series of formulas. The *Tabulatur*, or tablature, a term borrowed from music and not found among the earliest documents, signified, in musical nomenclature, a bit of music written not with notes, but with letters or figures, designed to initiate the student into vocal or instrumental music. But as a code for the meistersingers it had to be mastered by whoever wished to be of the guild. In order to teach scholars more easily the content of the code, it was drawn up in short poems. In fine, it was a book of rules, the text book of the meistergesang. This *Tabulatur* dealt with three matters: (1) the kinds of poems and the parts of a meistergesang; (2) permissible rhymes; (3) the mistakes, which are the main business, and have to do (*a*) with errors of delivery, of melody, of structure, and of opinion and (*b*) chiefly, however, with errors of rhyme or mangling of words or cacophony.

The school had inside and outside members, called by divers names. Those who were still studying the *Tabulatur* were called *Schüler;* those who had mastered it, *Schulfreunde;* those who could correctly sing the songs of others, *Singer;* those who could write new words to a tune already accepted as correct, *Dichter;* and those who had both written and composed a new and original song true to the *Tabulatur* were *Meister.* Meetings were held on festivals, chiefly on Sunday after service and in the church. Very often the singers met in the town hall or at an inn. Prizes were awarded, and those who sang ill were fined. The prize was sometimes money, sometimes a crown, as at Nuremberg in the time of Hans Sachs. Flowers had also an important part in these competitions. Often in the older days one singer would hang up a wreath as a challenge and as a reward for victory. Finally may be mentioned the fact that the meistersinger often wore a costume which was not seldom motley and which was often sumptuous.

The various songs were divided into three strophes, and each strophe was divided into two *Stollen,* alike in metrical structure, and a discant or *Abgesang.* Plate gives a long list of the various features of rhythm and rhyme in this complicated poetry, in all of which we observe a singular likeness to the technicalities invented or slavishly aped by the lesser, and indeed often enough by the better, poets two centuries earlier in southern France. The best feature of the meistersinger's art was that it throve among the humbler folk, refined them, gave them a sense of nationality, opened the way for the artistic treatment of better themes, and spread widely the love of artistic music among those who needed most a sense of form.

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MEISTERSINGER VON NÜRNBERG, nŭrn′bĕrk, Die. A musical comedy in three acts by Richard Wagner; first produced in Munich, June 21, 1868; in the United States, Jan. 4, 1886 (New York). It is a faithful and historically accurate picture of the meistersinger's art. See Meistersinger.

MEITZEN, mīts′en, August (1822–1910). A German statistician and political economist, born in Breslau and educated at Heidelberg and Tübingen. He was a prominent member of the Statistical Bureau and in 1892 was made honorary professor of the science of statistics and of political economy at the University of Berlin. His contributions to the science of statistics include *Die internationale land- und forstwirtschaftliche Statistik* (1873) and *Geschichte, Theorie und Technik der Statistik* (2d ed., 1903); he also wrote *Die Mitverantwortlichkeit der Gebildeten für das Wohl der arbeitenden Klassen* (1876) and *Siedelung und Agrarwesen der Westgermanen und Ostgermanen, etc.* (1896).

MEJERDA, me-jĕr′dĕ, or **MEJIRDA,** mē-jĭr′dĕ. A river of north Africa. It rises in the Great Atlas Mountains in eastern Algeria and, after an easterly and northeasterly course of over 200 miles, mainly through Tunis, flows into the Gulf of Tunis on the Mediterranean, 24 miles north of the capital. It was the ancient Bagradas, with its mouth at Utica, now Bu-Chateur, 7 miles to the south.

MEJÍA, mȧ-hē′ȧ, Tomás (c.1812–67). A Mexican general, an Indian by race. He took a prominent part in the war with the United States and served with Miramón (q.v.) and Zuloaga against Juárez in 1858 and 1859. On the occasion of the French intervention he did good service on the Imperialist side. He was present at the siege of Querétaro in 1867, was captured with other officers in Maximilian's army, and was with them court-martialed and shot. See Maximilian.

MEJIR′DA. A river of north Africa. See Mejerda.

MEKHITARISTS, or **MECHITARISTS,** mĕk′ĭ-tȧr-ĭsts. A congregation of Armenian Christians who reside on the island of San Lazzaro at Venice, but have also obtained a footing in France, Austria, Turkey, Russia, and elsewhere. They derive their name from Mekhitar or Mechitar (i.e., the Comforter) da Petro (born 1676, died 1749), who in 1701 founded at Constantinople a religious society for the purpose of introducing Western culture among the Armenians. He had already become a Catholic and soon had to flee. In 1702 he founded a convent at Modon in the Morea, then under the rule of Venice. Pope Clement XI in 1712 confirmed the congregation, gave it the Benedictine rule, and made Mekhitar its abbot. The war between Turkey and Venice compelled its transference in

1715 to Venice, where, on the island of San Lazzaro, the Mekhitarists held a convention in 1717. In 1773 a split in the congregation occurred, and a branch is now established in Vienna. The Mekhitarists acknowledge the supremacy of the Roman pontiff. The most useful occupation of the Venetian branch is printing the classic writings of Armenian literature, including an Armenian translation of the Bible (1734); their editions are universally admitted to be the best and most correct. They also issue a journal, which is much read throughout the Levant. Those in Vienna conduct a German bookstore. For the history of those at Venice, consult Boré, *Le couvent de Saint Lazare à Venise, ou histoire succincte de l'ordre des Méchitaristes arméniens* (Paris, 1837) and *Méchitaristes arménien de Venise* (ib., 1869); for those at Vienna, consult Scherer, *Die Mechitaristen in Wien* (5th ed., Vienna, 1892); for the life of the founder, consult *Le vie du serviteur de Dieu Mechitar* (Venice, 1901).

MEKLONG, mā'klŏng'. An important port on the south coast of Siam at the mouth of the Meklong River, 40 miles southwest of Bangkok (Map: Siam, C 4). The population is about 10,000, consisting chiefly of Chinese merchants and Siamese fishermen.

MEK'NEZ. A city in Morocco. See MEQUINEZ.

MEKONG, mâ-kŏng', or **CAMBO'DIA.** The largest river of Indo-China. Its ultimate source has not been ascertained, but it is supposed to rise in the mountains of central Tibet, not far from the sources of the Yang-tse-kiang (Map: French Indo-China, E 4). It flows in a generally southeasterly direction, first through Tibet and China proper, where it is generally called Lantsang, and then through Indo-China, where it forms at first the boundary between Burma and Tongking, then between Annam and Siam. Its lower course is through Cambodia and Cochin-China. The course of the Mekong after it enters Indo-China becomes very crooked and interrupted by rapids and falls, which prevent the use of this great river as a waterway. It is only for the insignificant part of its length below Khong, a town in the southeast corner of Siam, that the river becomes navigable. Here its flow becomes less turbulent as it enters its great alluvial plain. Finally it divides into a number of arms, forming a marshy delta which occupies almost the whole of Cochin-China and through which the Mekong enters the China Sea after a total flow of about 2800 miles. At the town of Pnom Ponk in Cambodia an arm extends northwestward from the Mekong to the large lake Tonle Sap, which at one time discharges into the Mekong and at another is fed by it.

ME'LA, POMPONIUS. A Latin writer, the first to compose a strictly geographical work. He was a native of Spain and is believed to have lived in the time of the Emperor Claudius, but nothing whatever is known concerning him. Mela's compendium of geography is a brief work, in three books, and is entitled *De Situ Orbis.* The text is greatly corrupted, on account of the abundance of proper names; but the style is good, and the author shows a very creditable diligence in research and discrimination in the use of his authorities. The work is valuable too because this book and the geographical parts of the *Historia Naturalis* of Pliny are the only formal treatises on geography known to us from classical times. The editio princeps appeared at Milan in 1471, and there is an early translation by Arthur Golding (London, 1585). There are good editions by Tzschuche (Leipzig, 1807), Parthey (Berlin, 1867), and Frick (Leipzig, 1880). Consult: E. H. Bunbury, *Ancient Geography*, vol. ii (London, 1879); W. S. Teuffel, *Geschichte der römischen Litteratur*, vol. ii (6th ed., Leipzig, 1909); M. Schanz, *Geschichte der römischen Litteratur*, vol. ii, part ii (3d ed., Munich, 1913).

MEL'ALEU'CA. A genus of plants. See CAJEPUT.

MELAM'PUS (Lat., from Gk. Μελάμπους, *Melampous*, Blackfoot, from Gk. *μέλας*, black + *πούς*, foot. Tradition said Melampus' foot was deeply burned by the sun when he was a boy). In Greek legend, the son of Amythaon; his mother is said by different authors to be Aglaia, Rhodope, or Eidomene. He is represented as a physician and prophet. Since two serpents, whose lives he had saved, licked his ears while he slept, he had power to understand the language of birds and beasts. He is said to have acquired his powers of divination from Apollo, who imparted to him all the secrets of the art of medicine, and he was said to have discovered the herb melampodium, a kind of hellebore (q.v.). Melampus appears in two groups of legends. In one he and his brother Bias came from Thessaly to Pylus, where Bias fell in love with Pero, daughter of Neleus. Her father, however, required her suitor to bring to him the herds of Iphiclus, a Thessalian prince. Melampus went on this mission, was seized and thrown into prison, but overheard the worms in the beams predict the speedy fall of the building. He told his jailers, who believed, and with him escaped before the fall. The King, hearing of his gifts, secured his aid in curing a disease of his son, of long standing, and as his fee gave him the much desired cattle. He was also said to have left Neleus and to have gone to Argos, where he cured the Argive women, or, according to others, the daughters of King Prœtus, of madness sent by Dionysus or Hera. As a reward he received for himself the hand of one of the daughters, Iphianassa, and a third of the land of Argos and another third for Bias. Thus their descendants, including the prophet Amphiaraüs, ruled along with the descendants of Prœtus. At Ægosthena in Megaris Melampus was worshiped as a god, having a temple and apparently games in his honor.

MELANCHOLIA, mĕl'an-kō'lĭ-â (Lat., from Gk. *μελαγχολία*, black bile, from *μέλας*, *melas*, black + *χολή*, *cholē*, bile). A form of insanity characterized by depression, a painful emotional state, intellectual enfeeblement, weakened attention, and abulia. The melancholiac is gloomy, full of forebodings and fearful anticipations, convinced of physical inferiority and of moral worthlessness, and often contemplates, even if he does not commit, suicide. See MANIC-DEPRESSIVE INSANITY; INSANITY.

Involutional Melancholia. An insanity of the involutional period of life, characterized by great emotional depression, apprehension, and painful anxiety. It occurs in women between 40 and 50 years of age, in men after 50. Many show senile changes, especially arteriosclerosis. The menopause seems to be an etiological factor in woman. The exciting cause is often emotional shock or prolonged mental strain. Heredity has little influence. After months of headache, pressure, vertigo, insomnia, mental weakness,

neurasthenia, the patient is plunged into a deep apprehensive depression, and, tortured by delusions of sin, cowering with fear, she passes into a condition of very painful anxiety. She may be diverted at times, in cases where apprehension is slight and consciousness is unclouded, orientation being preserved; but in most cases agitation is shown by groaning, wringing the hands, and repeated appeals to God for help. Rare cases become mute, inactive, and resistive, refusing to eat, and quite negativistic, because of controlling delusions and hallucinations, rarely because of retardation. There may be hypochondriacal delusions, delusions of sinfulness, of persecution, of poverty, of unworthiness, or of possession; nihilistic ideas, or ideas of grandeur. The last are unfavorable symptoms.

Hydrotherapy best controls the wasting agitation. Constant watchfulness, day and night, is essential, the insomnia must be relieved, and nutrition must be sustained. The possibility of suicide must always be borne in mind. Usually three years elapse before the recoverable cases begin to improve. See INSANITY.

MELANCHTHON, mē-lăṉk′thon, *Ger. pron.* mā-läṉk′tōn, PHILIPP (1497–1560). The associate of Luther in the Protestant Reformation and the foremost teacher of his time; in the words of Hallam, "far above all others the founder of general learning throughout Europe." He sprang from the middle class, as did Luther from the lower. His father was an armorer in favor at court, his mother the daughter of the burgomaster of Bretten in Baden, where he was born Feb. 6, 1497. By the advice of his granduncle, the learned Reuchlin, he changed his family name, when he entered the University of Heidelberg at the age of 12, from Schwarzerd (Black Earth) into its Greek equivalent, Melanchthon, a common practice among scholars. Having taken the bachelor's degree when 14, he took the master's degree at Tübingen when 17 and at once began to lecture on Terence, Vergil, and rhetoric; when 19 he published an edition of Terence, which ran through 73 editions in the course of about a century. His Latin and Greek grammars enjoyed still larger use even in Catholic schools.

Most opportunely for Luther, who had posted his theses the year before, Melanchthon was now called to the chair of Greek at Wittenberg and in 1518 delivered his inaugural upon "Reform in the Studies of Youth." This address won the admiration of those who had depreciated him for his boyish appearance. The next year Melanchthon took the bachelor's degree in theology, but modestly declined the doctorate. Never ordained, never preaching, he remained, like Calvin, a lay theologian to the end of his days. His lectures were thronged, sometimes, as reported, to the number of 2000, including even princes and noblemen.

From his classical studies he was drawn by Luther's urgency and the prevailing ferment into the field of theology. By his *Loci Communes*, i.e., general outlines of theology, he made in 1521 his first great contribution to the Reformation. From Melanchthon's architectural and organizing spirit, according to Dorner's view, the truth born in Luther's heart received its objective form and the stamp of validity. Equally important was the aid he gave to Luther's Bible work, in which the accuracy is his, while its idiomatic force and beauty are Luther's. In 1526 he became professor of theology in name, as for years he had been in fact.

Among the Reformers, Melanchthon was characteristically the peacemaker. The Augsburg Confession, presented by the Protestants at the Diet in 1530, surprised even the Catholics by its moderate tone. The tone was Melanchthon's, who drafted it from articles drawn up by Luther. In 1531 Melanchthon published his *Apology*—a vindication of the Augsburg Confession and the most learned of the Lutheran symbols. After this date he wrote his name Melanthon, as easier to pronounce. His irenic spirit prompted him to issue a modified edition of the Confession, the *Variata* (1540), generalizing specific statements of the Lutherans objectionable to the Calvinists, with the design of removing impediments to the union of the two parties. But such efforts brought only bitter trouble upon Melanchthon. He had now reached the limit of his successes, and his remaining years were darkened by the failure of his efforts for a more ethical theology and for the union of the Protestant factions.

Melanchthon's treatises on ethics, in which Aristotle was his master, became standard textbooks. These ethical studies revealed to him defects in his theological masterpiece, the *Loci Communes*, which he amended by successive revisions in 1535 and 1543. They also occasioned a serious breach between the Philippists and the strict Lutherans, whose extreme denial of the freedom of the will made Christian ethics impossible. Cries of heresy arose, which no explanations could still. Another breach was caused by Melanchthon's slow but sure change from the Lutheran conception of the mode of Christ's presence in the Lord's Supper to the Calvinistic. A third ground of odium was Melanchthon's willingness, for the sake of avoiding civil war, to compromise with the Catholics by securing tolerance of evangelical doctrine, but retaining most of the Roman ceremonies, as adiaphora (things indifferent). In the bitter controversy which ensued the Philippists were hounded as knaves, Samaritans, and Baalites. Melanchthon's relations with Luther were strained, but to the last his gentle spirit held captive that fiery heart. He looked forward to death as "escape from the madness of theologians." His last prayer was "that the churches might be of one mind in Christ." He died April 19, 1560.

Melanchthon seems from one point of view to have been born before his time and has been long in coming to his rights. In a period of fanatical strife, he earnestly strove to bring about Christian unity. But on the honor roll of the Reformation his is conspicuously the historical, judicial, progressive spirit. His one great weakness was his consenting with Luther and others to the bigamy of Philip of Hesse, and his regret for it threw him into a dangerous illness. Declining invitations to other German cities, to France, to Denmark, to England, he stood unflinchingly at his post in stormy Wittenberg. The churches he found it impossible to reconcile now unite in honoring him. Lacking the dramatic element which draws the popular heart to Luther, his blending of progress and tolerance, of sweetness and light, attracts the cultivated mind.

Bibliography. Melanchthon's works, including his correspondence, fill volumes i–xxviii of the *Corpus Reformatorum*, edited by Bretschneider and Bindseil (Halle, 1832–50). The Wittenberg edition of his works was published in

1562–64. His *Loci Communes*, edited by Plitt (Erlangen, 1864), was reëdited by Kolde (ib., 1890). In German: his *Leben und Wirken*, by Matthes Altenburg (1841; 2d ed., 1846); his *Leben und Schriften*, by C. Schmidt (Elberfeld, 1861). For biography: his *Life* (in Latin), by his friend Camerarius (Leipzig, 1566), edited by Neander in *Vita Quattuor Reformatorum* (Berlin, 1846); also Krotel's English translation of the *Life* by Ledderhose (Philadelphia, 1855). J. W. Richard, *Philipp Melanchthon* (New York, 1898), is both popular and accurate. Valuable in special points of view are: Galle, *Charakteristik Melanchthons* (Halle, 1840); Hartfelder, *Philipp Melanchthon als Præceptor Germaniæ* (Berlin, 1889); Herrlinger, *Die Theologie Melanchthons* (Leipzig, 1878). Philip Schaff, *History of the Christian Church*, vols. vi, vii (New York, 1890); id., *Creeds of Christendom* (ib., 1878), contain much valuable biographical and theological matter concerning Melanchthon; also *Cambridge Modern History*, vol. ii (Cambridge, 1904), contains an exhaustive bibliography.

MEL'ANE'SIA (Neo-Lat., from Gk. μέλας, *melas*, black + νῆσος, *nēsos*, island). A name applied to that division of Oceanica in which the inhabitants have a dark skin, as distinguished from those of Micronesia and Polynesia, who are much lighter. (See MELANESIANS.) It comprises all the islands lying between New Guinea and the Fiji Islands and between the Equator and the Tropic of Capricorn (Map: East Indies, H 5). It includes the following groups: Admiralty Islands, Bismarck Archipelago, Solomon Islands, Santa Cruz, New Hebrides, New Caledonia, Loyalty Islands, and Fiji Islands. Politically Melanesia is apportioned to Germany in the north, to England in the Solomon Islands and Fiji, to France in the south, while the New Hebrides and Santa Cruz are ruled by a mixed Franco-British commission. For details, see the articles on the separate groups.

MELANESIANS. The natives of that part of Oceanica known as Melanesia (q.v.). Some authorities consider them physically and linguistically a compound of the woolly-haired black Papuans, who may have been the aborigines of Melanesia, with the smooth-haired, light-colored Malays, who came to the archipelago as adventurers and immigrants. Of all the islanders of these regions they present in individual cases the strongest likeness to the equatorial African negro. Other scholars recognize a "Melanesian race," divided into Papuans and Melanesians proper, the latter being taller and more dolichocephalic than the former, and having generally the large square or lozenge-shaped face with the straight or *retroussé* nose of the Melanesian race. The Melanesians are in general sedentary and devoted to agriculture, being only occasionally hunters and fishers, and they use the pig as a domestic animal. Many of the Melanesians make, or once made, pottery, an art practiced by none of the Polynesians. Its present distribution is limited to New Caledonia, and Espiritu Santo, the Shortland Islands, Bougainville, Buka, and the Fiji group; but ceramic remains have been found in Malikolo, Pentecost, Lepers' Island, and Ambrym. The Melanesians have double canoes and outriggers, but are not given, like the Polynesians, to long voyages. With most of them the characteristic dwelling is built on piles (see LAKE DWELLINGS), and often artistically decorated, while communal houses are found all over the Melanesian area. The bow and arrow (sometimes poisoned) are in use, with the club and spear, which lend themselves to ornamentation. Some of the hafted stone axes of the Melanesians are very fine specimens of their kind. Kava, the characteristic drink of the Polynesians, is absent or subordinate, but betel chewing prevails generally except in New Caledonia. The Solomon Islands and a few other places still present examples of cannibalism, while head hunting, together with the preservation of the skulls of the dead, is well known. Taboo assumes in Melanesia a less clear form than in Polynesia, amounting to simple interdiction without the intervention of mysterious forces. Tribes proper are rare in Melanesia. The regulation of "group marriages" is very strict. Secret societies abound, including the famous *duk-duk* (q.v.), which corresponds in several curious respects to the modern club. There is usually a strict segregation of the sexes, the men living together in distinctive "men's houses" and the women being debarred both from these and from ceremonial performances.

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MEL'ANI'IDÆ (Neo-Lat. nom. pl., from Lat. *melania*, from Gk. μελανία, blackness, from μέλας, *melas*, black). An extensive group of fresh-water gastropod mollusks characterized by the long spiral shell, with the whorls more or less knobbed or tuberculated, ribbed or striated, and a horny operculum. The animal has a broad foot or creeping disk, grooved in front; it is ovoviviparous. The species date from the Cretaceous period. They live in rivers, and the tubercles protect them from injury in rapid rocky streams. The species are distributed throughout north Africa, Syria, China, India, the Philippine Islands, Polynesia, and South America. In the southern United States, mostly in a rough square formed by the Tennessee, the Mississippi, the Chattahoochee rivers and the Gulf of Mexico, occur in abundance the Pleuroceridæ, represented by the genius *Io*, which were formerly associated with the Melaniidæ.

MEL'ANIP'PE. 1. In Greek mythology, a daughter of Chiron. Being about to bear a child, she fled to Mount Pelion to conceal herself from her father, and was changed into a mare by Artemis and placed among the constellations. She is also called Evippe. 2. A sister of Mele-

ager, who died with grief at her brother's fate. 3. A sister of Hippolyte and Queen of the Amazons.

MEL'ANIP'PUS. In Greek mythology, a Theban, son of Astacus. In the expedition of the Seven against Thebes (see SEVEN AGAINST THEBES, THE) he dealt Tydeus (q.v.) the wound which caused his death. He was himself killed by Amphiaraus (q.v.).

MEL'ANISM (from Gk. *μέλας, melas,* black) and **AL'BINISM** (from Lat. *albus,* white). Melanism is a phenomenon due to excess of pigment, while albinism is due to its absence. Albinism is a pathological condition, while melanism is usually normal. Melanism occurs in insects, fishes, reptiles, birds, and mammals, and is noticeable in man. While in animals and man albinism is the result of disease, it may occur in nature as a sport; thus we have albino varieties. The absence of pigment is normal in such Arctic animals as the polar bear, the northern or white owl, etc.; others turn white in winter, as the Arctic fox, the American varying hare, the ptarmigan, etc. The change of color in such cases is apparently due to cold and is associated with the development of numerous air bubbles in the hair; in some cases there is no loss of pigment, which is merely concealed by the air bubbles (Newbigin).

In man the dark races owe the color of their skin to a black pigment deposited in the deeper layers of the epidermis, this pigment in the blond or white race being but slightly developed. As the darkest negroes inhabit the low torrid coast of west Africa, the pigmentation seems due to light, heat, and moisture combined. On the other hand, the cool damp climate of elevated or mountain regions and of the polar lands causes melanism. It is well known that the insects, more especially moths and butterflies, inhabiting alpine slopes or mountain regions are darker than individuals of the same species, or of allied species, living on the drier and warmer lowlands. Packard has called attention to the melanotic moths on the summits of the White Mountains of New Hampshire and along the coast of Labrador. Leydig was the first, perhaps, to point out that variation towards greater darkness of coloring is connected with the action of moisture. The temperature experiments of Weismann, W. H. Edwards, and Merrifield have proved that besides moisture and elevation cold is an important agent in excessive pigmentation, at least, of Lepidoptera and beetles. The most striking experimental evidence of the importance of humidity in the inducing of melanistic conditions is that presented by Beebe in his experiments with ground doves and other birds. Under conditions of intense humidity the birds became successively darker with each molt, until signs of iridescence were apparent. But melanism is not entirely confined to northern animals. The black leopard of southern Asia is a melanotic variety or sport of the common leopard. The varying hare is infrequently melanistic.

The prevailing coloring matters in the pigments of mammals are the dull-colored melanins. It has been thought that in mammals the pigment is directly derived from the hæmoglobin of the blood. Floyd, however, has shown that the skin of the negro contains about twice as much iron as the white skin, apparently due to the proteid present in the pigment granules. Consult: Newbigin, *Color in Nature* (London, 1898); Delépine, "Origin of Melanin," in *Journal of Physiology,* vol. xi (ib., 1890); C. W. Beebe, in *Zoologica,* vol. i (New York, 1907).

MEL'ANITE (from Gk. *μέλας, melas,* black). See GARNET.

MEL'ANORRHŒ'A (Neo-Lat., from Gk. *μέλας, melas,* black + *ῥοιά,* rhoia, a flowing). A genus of trees of the family Anacardiaceæ. To this genus belongs the black varnish tree (*Melanorrhœa usitata*) of Burma and the northeast of India, called *Theet-see* or *Zitsi* in Burma, and *Khew,* in Manipur, attaining a height of 100 feet, with large, leathery, simple, entire, deciduous leaves and axillary panicles of flowers. It is much valued as a varnish for painting vessels intended to contain liquids, and also as a size glue in gilding. The varnish, which is obtained by tapping the stems, turns black on exposure to the air. See VARNISH TREE.

MELAPHYRE, měl'ȧ-fīr. See BASALT.

MELAZZO, mȧ-lät'sō. See MILAZZO.

MEL'BA, NELLIE (1861–). An Australian operatic soprano. Her family name was Mitchell, Melba being an adaptation from Melbourne, in which city she was born. She studied under Marchesi and made her first public appearance as Gilda in *Rigoletto* at Brussels in 1887. An unsurpassed coloratura singer, she became known and admired in every great city of the world, being especially successful in grand opera in America. Her first appearance in the United States was at the Metropolitan Opera House, New York, in 1893, in *Lucia di Lammermoor.* Though possessing a voice of exceptional purity and beauty, she failed to develop real dramatic intensity and histrionic ability. After some years in concert, Mme. Melba returned to opera in 1915–16 as a member of the Chicago Company. Consult A. G. Murphy, *Nellie Melba: A Biography* (London, 1909).

MELBOURNE, měl'būrn. The capital of Victoria, Australia, situated chiefly on the north bank of the Yarra, which river finds its outlet a few miles from the city in Hobson's Bay (Map: Australasia, G 6). The bay is the north bend of the spacious inlet known as Port Phillip, the entrance of which is 40 miles south of the city, near the southernmost extremity of the continent. The chief port is about 2½ miles distant from the business centre, but vessels with a 22-foot draft may go to the heart of the city. Melbourne occupies a high rank among British colonial ports. Its tonnage in the arrival of vessels in the over-sea trade is second to that of Sydney, but in interstate trade exceeded that of any other Australian port in 1912, the entrances in interstate trade in that year being 2,929,486 tons against 2,466,763 at Sydney. In the over-sea trade the entrances direct from other countries were 690,951 tons against 1,189,215 at Sydney, and from foreign countries via other commonwealth ports 1,679,459 against 2,076,067 at Sydney. In total tonnage, however, of foreign, interstate, and local from other ports of the state it was in 1912 second to Sydney. Melbourne is connected with all state lines of railway and is the centre of the system. It is the see of a Roman Catholic archbishop and of a Protestant bishop, and the seat of various consuls, including a United States consul general. The city is laid out with straight, wide, and regular streets, wood-blocked or macadamized, and supplied with gas, electric lighting, street tramways, and fresh water. The princi-

pal streets are 99 feet wide. It has been said that Melbourne's public buildings are finer than those of any other city of the same size in any part of the world. Among the most notable must be mentioned the magnificent Houses of Parliament, with a library of about 60,000 volumes; the Treasury; the Law Courts; the building assembling within its walls: (1) the Public Library of about 200,000 volumes, (2) the National Gallery, (3) the Technological Museum, and (4) the Sculpture Gallery; the Post Office; offices of the Mining, Lands, and other government departments, the Custom House; the Mint; the Treasury; the University, with its fine attached museum, its magnificent Wilson Hall, and affiliated Trinity, Ormond, and Queen's colleges; the Town Hall, with its grand organ and its assembly room; the Stock Exchange; the Exhibition Building in the Carlton Gardens, in which the commonwealth's first Parliament was inaugurated by King George V, then Prince of Wales, in the presence of an illustrious and representative gathering; the Produce Markets; the Eastern Market; the Fire Brigade Station; the City Baths; the London Bank of Australia; the Banks of Australasia, Victoria, and New Zealand; the Colonial, the English, Scottish, and Australian, and the Commercial banks; a Mint, opened in 1872; the National Mutual Life Office; the Equitable Life Assurance Society of the United States of America; the Western, the Queen Victoria, and the Fish, Cattle, and Hay markets; St. Patrick's Roman Catholic Cathedral; St. Paul's Anglican Cathedral; the Scots, the Wesley, the Independent, and the Baptist churches; and theatres and numerous amusement halls. There are many parks and pleasure grounds in Melbourne and its suburbs, each of the principal suburbs maintaining its own separate park, a beautiful government domain, botanical and zoölogical gardens, and cricket and football grounds. The Governor-General's and State Governor's residences are here; the commonwealth headquarters barracks; an observatory and a meteorological station; numerous schools for secondary education, including the famous Scotch College; and the institutions of many learned and scientific and literary societies.

Melbourne is a manufacturing city in the widest sense. The entrance to Port Phillip, which is only 2 miles wide, is formed by two projecting and strongly fortified promontories, called the Heads. Vessels drawing 22 feet reach Melbourne at ordinary tides. There are two dry docks at Melbourne and the splendid Alfred Graving Dock at Williamstown. The chief exports are gold, silver, wool, hides, cattle, and sheep. Six-sevenths of the commerce of the state is carried on by Melbourne. For further information regarding trade, etc., see VICTORIA.

Melbourne was first colonized in 1835 under the name of Dootigala, and received its present name in 1837 from Sir Richard Bourke, Governor of New South Wales, who named it after Lord Melbourne, then British Prime Minister. It became the see of a bishop in 1847, and in 1851 the capital of the newly formed colony of Victoria. The discovery of gold in Victoria in 1851 gave an extraordinary impetus to the material prosperity of Melbourne. The Australian centenary was commemorated at Melbourne in 1888 by an international exhibition. The first federal Parliament of the Australian commonwealth was opened in the exhibition building on Wednesday, May 9, 1901, by King George V, then Prince of Wales, Melbourne being chosen as the temporary capital pending the choice of a seat on federal territory in New South Wales. The commonwealth has acquired an area of about 900 square miles from the state of New South Wales for a national capital. Population of Melbourne proper (1901), 67,881, including suburbs, 493,956; estimated, 1912, including suburbs and shipping, 628,430. Consult: Labilliere, *Early Days of Melbourne* (Melbourne, 1857); id., *Early History of the Colony of Victoria* (London, 1860–81); Finn, *Chronicles of Early Melbourne* (Melbourne, 1889); Gordon and Gotch, *Australian Handbook* (ib., 1906).

MELBOURNE, WILLIAM LAMB, second VISCOUNT (1779–1848). An English statesman. He was born at Melbourne House, London, March 15, 1779; was educated at Eton and at Trinity College, Cambridge, where he graduated in 1796, and at Glasgow (1799), where he studied jurisprudence and politics under Millar. One year after his admission to the bar (1804) he entered the House of Commons for Leominster and joined the Whig opposition, under the leadership of Charles James Fox. He represented several other constituencies within the next 15 years and his whole career in the House of Commons was characterized chiefly by indolence. Drifting towards conservatism, he accepted the chief secretaryship of Ireland in Canning's government. In 1828 the death of his father transferred him to the House of Lords. In 1830 he accepted the seals of the Home Office in the government of Earl Grey, but his administration was by no means popular or successful. In July, 1834, Earl Grey retired and William IV sent for Melbourne. In November, however, on a slight pretext, the King, who had become entirely alienated from the Whigs and Melbourne, invited Sir Robert Peel to form a Conservative ministry. On Peel's arrival in England he dissolved Parliament and appealed to the country, but was defeated. The new Commons, resenting the interference of the King, made Peel's task an impossible one, so early in 1835 Melbourne again became First Lord of the Treasury and Premier. On the accession of Queen Victoria in 1837 it became the duty of Melbourne to instruct the young sovereign in the various duties of her high station, and but few other functions did he perform so well. In 1841 his government was succeeded by that of Sir Robert Peel. Henceforward Melbourne took little part in public affairs. His administrations advocated reform of Church tithes in both England and Ireland, of municipal corporations, taxation, criminal law, postal rates and education, yet he himself cared little for reform. He married (1805) a daughter of the Earl of Bessborough, who, under the title of Lady Caroline Lamb, attained some celebrity as a novel writer and a correspondent of Lord Byron. Lord Melbourne died Nov. 24, 1848. Consult W. M. Torrens, *Memoirs of Lord Melbourne* (London, 1878), and Lloyd Sanders, *Lord Melbourne's Papers* (ib., 1889).

MELCHERS, mĕlk'ĕrs, GARI J. (1860–). An American genre, figure, and portrait painter. He was born in Detroit, Mich., studied at the Düsseldorf Academy, under von Gebhard, and at the Ecole des Beaux-Arts, Paris, under Lefèbvre and Boulanger, and early made a specialty of Dutch peasant life, which he depicts with great insight and sympathy. He paints in cool grayish tones, with firm outlines,

and his work is simple, sincere, and often of almost brutal directness and naturalism. Melchers received many decorations and prizes, including medals of honor at Paris (1889) and Berlin (1891), and gold medals at Amsterdam, Munich, Vienna, Dresden, Antwerp, Philadelphia (1892), Buffalo (1901), and St. Louis (1904). Among his chief works are: "Maternity" and "Nurse and Children" (both in the Luxembourg, Paris); "The Family" (National Gallery, Berlin); "The Ship Builder" (Royal Gallery, Dresden); "Dutch Skaters" (Pennsylvania Academy, Philadelphia); "Sailor and his Sweetheart" (Carnegie Institute, Pittsburgh); "Penelope" (Corcoran Gallery, Washington); "The Madonna" (Metropolitan Museum, New York). Melchers also painted religious pictures, mural decorations, notably "Peace and War" in the Congressional Library at Washington, and many portraits, among which are Colonel Roosevelt (National Gallery, Washington) and Mrs. Melchers (Detroit Museum). He became Commander of the Legion of Honor and a member of the National Academy of Design, New York.

MELCHERS, Paul (1813–95). A German cardinal. He was born at Münster, Westphalia. First he studied law at Bonn, but after a few years of practice in his native town he turned to the ministry, for which he was prepared at Munich. In 1841 he was ordained priest and in 1857 was made Bishop of Osnabrück. In 1865 he was nominated Archbishop of Cologne by Pius IX. At the Vatican Council Melchers at first opposed the doctrine of infallibility, but afterward acknowledged it, when the majority decided in favor of it. He took a prominent part in the Kulturkampf, and thereby frequently came in contact with the government authorities, and was removed from office in 1876. He escaped to Maestricht (Holland) from where he administered his diocese for nearly 10 years, resigning in 1885. He then went to Rome, became Cardinal in 1885, and joined the Jesuits in 1892. He wrote: *Eine Unterweisung über das Gebet* (1876); *Die katholische Lehre von der Kirche* (1881); *Das Leben der allerseligsten Jungfrau und Gottesmutter* (1884); *De Canonica Diœcesium Visitatione* (1892).

MELCHIADES, měl-kī′ȧ-dēz. See Miltiades.

MELCHIOR, Charles Jean. See Vogué, C. J. Melchior, Marquis de.

MELCHITES, měl′kīts (MGk. Μελχίτης, *Melchitēs,* from Syr. *malkāyē,* royal, from *melek,* king). Originally a nickname given by the Monophysites in the fifth century to the Christians who remained orthodox in the patriarchates of Jerusalem, Alexandria, and Antioch. Since the thirteenth century, however, the name has been applied to the Christians of Eastern rite in Syria and Egypt who are in communion with Rome. They have had a patriarchate of their own, taking its title from Antioch, since 1744. Besides Damascus, there are 12 other dioceses subject to his authority, with between 300 and 400 priests and over 100,000 lay people. See Eastern Rite, Churches of; Uniates.

MELCHIZEDEK, or **MELCHISEDEC,** měl-kĭz′ē-dĕk (Heb. *Malki-sedek,* king of righteousness, or Zedek is my king). A personage introduced in Gen. xiv. 18 as "king of Salem" and "priest of the most high God." After Abraham's return from the successful pursuit of Chedorlaomer (q.v.), King of Elam, and his allies, which he had undertaken in order to rescue Lot, he was met by Melchizedek; the latter offered the patriarch bread and wine and blessed him; whereupon Abraham gave Melchizedek tithes from the spoil. Many scholars regard this story as a legend or a legendary elaboration of an historical tradition and think that this Midrashic character is indicated by the names Salem, 'Peace,' and Melchizedek, 'king of righteousness,' which seem to them symbolical. But it is generally admitted that the names of the invading kings are historical; those of the kings of the Pentapolis seem to be Amoritish. *Urushalimmu,* or 'the city of Salim,' is the name of Jerusalem in the Amarna tablets; Melchizedek may mean '(the god) Zedek is my king' and should be compared with Adonizedek (q.v.), 'Zedek is king,' another ruler of Jerusalem, and some scholars maintain that an early document has been used, that the reference to "Abram, the Hebrew," renders it probable that it was a foreign source, and that it is essentially historical, though they are willing to concede that it may have been worked over at a later time. In the Haggada Melchizedek is identified with Shem; the reference to Melchizedek in Psalm cx. 4 is late and obscure, but points to other conceptions current about this mysterious personage. In the Epistle to the Hebrews (vi. 20, vii. 1–21) he is taken as typifying Christ. Various other views arose with regard to Melchizedek. A small sect in the fourth century called after his name Melchizedekians taught that he was a power or incarnation of God greater even than Christ. Epiphanius says that some in his day believed that Melchizedek was the Son of God in human form.

MELCHORA, měl-kō′rȧ. See Rama.

MELCHTHAL, mĕlk′täl, Arnold von. A legendary hero of the Swiss struggle for independence against Austria in the early part of the fourteenth century. Arnold was said to have killed the servant of an Austrian bailiff, who had come to Melchthal to seize the oxen of Melchthal's father, a well-to-do proprietor in Unterwalden. In revenge the Austrian put out his father's eyes. When Melchthal heard of his father's blindness he met his friends Fürst, of the Canton of Uri, and Stauffacher, of the Canton of Schwyz, on the banks of Lake Lucerne, and all three took an oath to do all in their power to liberate the three cantons from Austrian rule. This was in 1307, and the next year the mountaineers of the three cantons successfully waged war against the Austrians. The story is a myth. It is found in the *Chronicon Helveticum* of Ægidius Tschudi (1505–72), and was adopted by von Müller in his *History of the Swiss Confederation.*

MELCOMBE, měl′kŭm, George Bubb Dodington, Baron. See Dodington.

MELCOMBE REGIS AND WEYMOUTH, měl′kŭm rē′jĭs ănd wā′mŭth. A seaport of England. See Weymouth.

MELDE′NIUS, Rupertus. The real or more probably pseudonymous author of the *Paræsnesis Votiva, pro Pace Ecclesiæ, ad Theologos Augustanæ Confessionis,* which appeared in Germany about 1630 without place of publication or date. It is a plea to the Lutheran theologians to lay aside their acrimonious controversy.

MELEAGER, měl′ē-ā′jĕr (Lat., from Gk. Μελέαγρος, *Meleagros*). In Greek legend, the hero of the Calydonian boar hunt. (See Calydonian Boar.) In the earliest-known form of

the legend, which is found in the *Iliad*, he is the son of Œneus, King of Ætolia, and Althæa, daughter of Thestius. When the Calydonian boar laid waste the land he gathered a band of heroes and, after a hard struggle and much loss of life, slew the monster. A strife arose between the Ætolians and the Curetes over the spoils of the hunt; the Curetes were led by his mother's brothers. Meleager led his people to victory, until he killed his mother's brothers. Althæa then cursed her son and prayed the Furies and gods of the lower world to punish him. The hero in anger withdrew from the fight and, knowing his fate, refused to return until the Curetes had actually stormed the town, when he yielded to the prayers of his wife and went forth to save his people, and met his death, according to one story at the hands of the Furies, according to another at the hand of Apollo. A later and more popular version introduced many alterations. When Meleager was seven days old the Fates told his mother that the child would live till a brand then blazing on the hearth should be consumed. Althæa thereupon quenched the brand, and put it in a chest. Later, on the news of the death of her brothers, she, in her grief and rage, put the brand again upon the fire, and the hero at once wasted away. This story appears in an ode of Bacchylides. Later still new features were introduced. The Calydonian Hunt brought together many heroes, among them the wild Arcadian maiden Atalanta, with whom Meleager fell in love. (See ATALANTA, 2.) She first wounded the boar, and received from her lover the head and hide. These the sons of Thestius, brothers of Althæa, in jealousy, took from her, and were killed by their nephew, whereupon Althæa allowed the brand to be consumed. Althæa was said to have killed herself in remorse, while the lamentations of his sisters and the women of Pleuron so moved the gods that they changed them into guinea hens (*μελεαγρίδες*), with the exception of the two sisters, Deianira, later the wife of Hercules, and Gorge. This story seems due to Sophocles.

The Calydonian Hunt was a favorite subject with the vase painters from early times, and on Greek and Roman sarcophagi; it was also taken by the great artist Scopas as the subject for one of the pediments of the temple of Athena Alea at Tegea. Fragments of these sculptures are now in Athens. A statue of Meleager, copied from a work of Scopas, is now in the Vatican at Rome, and a finer copy of the head and torso in the Fogg Art Museum of Harvard University.

MELEAGER (fl. c.60 B.C.). A Greek philosopher and epigrammatist, born at Gadara in Syria. As philosopher, he wrote *Menippean Satires*, imitated by Varro (q.v.), perhaps also a work (*Περὶ Δοξῶν*) giving a summary of the views of various philosophers. He compiled the first known Greek anthology, a collection called the Garland (*Στέφανος*), which contained epigrams by 40 authors, as well as 130 epigrams of his own, mostly of an erotic character. (See ANTHOLOGY, 1.) These are preserved in the later collection of Constantinus Cephalus, known as the *Palatine Anthology*. Consult: Symonds, *Studies of the Greek Poets* (London, 1893), chap. xxi; Ouvré, *Méléagre de Gadara* (Paris, 1894); Radinger, *Meleagros von Gadara* (Innsbruck, 1895); Pomeroy, *Meleager, etc.* (London, 1895); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911).

MELEAGER, STATUE OF. A celebrated marble in the Vatican, representing the hero with his dog and a boar's head. The statue belongs to the Imperial period and was found near the Porta Portese at Rome about 1500. From its pathetic intensity of expression it is supposed to be a copy of an original by Scopas.

MEL'EA'GRIS (Lat., from Gk. *μελεαγρίς*, sort of guinea fowl, named after *Μελέαγρος*, *Meleagros*, Meleager). One of the two genera of the family Meleagridæ, containing the American turkey (q.v.); but the term belonged originally to one of the guinea fowls (q.v.). See Colored Plate of PEACOCK.

MELEGNANO, mā'lā-nyä'nō (formerly *Marignano*). A town of northern Italy, 10 miles southeast of Milan (Map: Italy, B 2). Pop., 1911, 7151. It is famous for a great victory won by Francis I of France over the Swiss and Milanese, Sept. 13–14, 1515. The defeat at Melegnano did much to destroy the prestige of the Swiss pikemen, who for a long time had enjoyed the reputation of being the best soldiers in Europe. Francis accepted the honor of knighthood on the field from the Chevalier Bayard. After the battle Francis I made a treaty with the Swiss, which lasted until the French Revolution. A second battle was fought here June 8, 1859, between a French force of 16,000 men, under Marshal Baraguay d'Hilliers, and a somewhat larger body of Austrian troops, the latter being routed.

MELEGUETTA (mĕl'ē-gĕt'tä) **PEPPER.** See GRAINS OF PARADISE; GUINEA PEPPER.

MELE'NA, ELPIS. A pseudonym of Marie Espérance von Schwartz. See SCHWARTZ.

MELÉNDEZ VALDÉS, mā-lān'dāth vāl-dās', JUAN (1754–1817). A Spanish poet, born at Ribera del Fresno in Estremadura, March 11, 1754. He graduated in law at Salamanca, where he soon fell under the influence of the so-called French school of writers. In 1780 he won the prize of the Spanish Academy for an ode. Coming to Madrid in 1781, Meléndez there enjoyed the favor of the minister and author, Jovellanos, who appointed him to a chair at the University of Salamanca. In this intellectual centre he became the chief figure of the Salamancan circle of lyric poets, who played an important part in the regeneration of Spanish literary production. With his comedy, *Las bodas de Camacho*, he won a prize offered by the city of Madrid in 1784; but the play failed on the stage. The next year he published his first volume of collected poems, which marked a decided improvement over most of the poetry that had been written since the *siglo de oro*. Meléndez now entered upon a political career that was to lead to his ruin. At his own request, made a judge of the court of Saragossa in 1789, two years later he was promoted to the chancery of Valladolid and in 1797 was given a post at the royal court. In 1798 Meléndez's constant friend, Jovellanos, fell from favor, and both were involved. Meléndez himself was exiled for a while, but in 1802 was allowed to settle in Salamanca. Having identified himself with the endeavors of the Napoleonic government in Spain, he incurred the hatred which his countrymen felt for the *Afrancesados*, and on several occasions he nearly lost his life at the hands of the excited populace. With the end of Joseph Bonaparte's rule he had to leave Spain, and, going into exile in France, he died at Montpellier, May 24, 1817. During this last period of exile he prepared a final edition of his lyrics,

which did not appear, however, until 1820. Meléndez was one of the few genuine poets that Spain produced during the decadent period of the eighteenth century. Consult the life of Meléndez by Quintana, prefixed to the edition of his poems of Madrid (1820), and also published with Quintana's prose works in volume xix of the *Biblioteca de autores españoles* (Madrid, 1852), and see also the edition of his poems in the *Biblioteca*, vol. lxiii (ib., 1869), and E. Mérimée's essay on him in the *Revue Hispanique*, vol. i (Paris, 1894).

MELETIUS, mĕ-lē′shĭ-ŭs (Lat., from Gk. Μελήτιος). The dates of his birth and death are unknown. Bishop of Lycopolis in the Thebaid in the beginning of the fourth century and founder of the sect of the Meletians. According to Epiphanius, during the persecution under Diocletian and Maximinus, many Christians were led through torture to renounce their faith; afterward repenting of their sin, they repaired to the bishops to receive absolution and to be reconciled to the Church. Peter, Archbishop of Alexandria, was willing to receive the backsliders on their doing penance, but Meletius refused to have any intercourse with them until the close of the persecution. This caused a schism, and Meletius became the leader of the disaffected. He traveled through the patriarchate, ordaining and excommunicating according to his own will, obtaining many followers, and disregarding the protest of the Egyptian bishops. This proselyting tour was extended to Palestine. But in 325 the Council of Nicæa checked his career, compelling him to remain at Lycopolis as a mere titular bishop without active jurisdiction. He died soon after this. The Meletians afterward allied themselves with the Arians against Athanasius, continuing, however, a distinct sect until the fifth century.

MELETIUS OF ANTIOCH (?–381). A famous Greek ecclesiastic. He was born in the beginning of the fourth century at Melitene in Armenia Minor. His first important appointment was to the bishopric of Sebaste, but he soon resigned this and retired to Berœa (Aleppo) in Syria. In 360 he was chosen Bishop of Antioch. The church in that city was rent in twain by the Arian controversy, but Meletius, whose position was not well understood, was accepted by both parties. He was generally respected for his virtues, and the Arians believed him on their side. He disappointed their expectations, however, and the dispute raged more fiercely than ever. Meletius was several times banished and recalled. The Council of Alexandria sent representatives to Antioch to settle the dispute, but Lucifer (q.v.) of Cagliari by his hot-headed advocacy of the orthodox cause defeated the plan. Meletius died at an advanced age, while presiding over the Council of Constantinople, in 381. His body was taken to Antioch and buried with great honor. His funeral oration was pronounced by Gregory of Nyssa. A part of the inaugural discourse of Meletius at Antioch is printed in the fifth volume of Galland's *Bibliotheca Patrum* (Venice, 1765–81).

MELFI, mĕl′fē. A town in the Province of Potenza, Italy, 41 miles south of Foggia (Map: Italy, E 4). It is situated on one of the sides of the extinct volcano, Monte Vulture, 1591 feet above the sea. Frequent earthquakes have destroyed most of its ancient buildings; the cathedral, dating from 1155, and the castle founded by Robert Guiscard, in which the Norman rulers lived, alone remain. The town hall has a Roman sarcophagus among its relics. The soil of the vicinity is extremely fertile and produces grain, wine, and olives. Melfi is a very ancient city and is mentioned as early as the fourth century. It was the capital of Apulia at the time of the Norman occupation; was pillaged by Frederick Barbarossa in 1167; and in 1528 was captured by the French general Lautrec, who put to death thousands of its inhabitants. Pop. (commune), 1901, 14,649; 1911, 13,744.

MELGAREJO, mĕl′gä-rā′hō, MARIANO (1818–72). A Bolivian soldier and revolutionist, born of illegitimate parentage at Cochabamba. Poorly educated, he entered the army as a common soldier, but through daring and bravery achieved high rank and fame. Taking part in various revolutionary movements, he became a power in politics. In 1865 he headed a successful revolution against President Achá and, assuming the presidency, exercised dictatorial powers. He became unpopular at once and his rule of six years was very stormy. He crushed out a revolt under General Belzú at La Paz (1866), and made a treaty with Chile adjusting a boundary dispute. He was overthrown in 1871 by a revolution led by Agustín Morales and was forced into exile. While living in Lima he was killed in an altercation with his son-in-law, José Sanchez.

MELI, mā′lē, GIOVANNI (1740–1815). An Italian dialect poet, born at Palermo. He studied and practiced medicine and in 1787 was appointed professor of chemistry at the University of Palermo. Meli wrote a number of *canzonette*, odes, and epigrams, mostly in Sicilian dialect, and made collections of Sicilian proverbs. His best work appears in his *Bucolica*, the *Fata galante*, the *Origini di lu mannu*, the mock-heroic *Don Chisciotti e Sanciu Panza*, and the *Favole morali*, in virtue of which he may be styled a Sicilian La Fontaine. His *Poesie* are included in the *Parnaso siciliano* (Palermo, 1874) and the best edition of his works is by Alfano (Palermo, 1894). Consult: Natoli, *Giovanni Meli: studio critico* (ib., 1883); De Sanctis, "Giovanni Meli", in his *Nuovi saggi critici* (Naples, 1914); Biondilillo, "L'arte di G. Meli," in *Rivista d'Italia* (Rome, 1912).

ME′LIA′CEÆ (Neo-Lat. nom. pl., from *melia*, from Gk. μελία, ash tree; so called because the leaves resemble those of the ash). A family of mostly tropical dicotyledonous trees and shrubs, containing about 40 genera and 750 species, natives of warm climates. Many of the species possess bitter, astringent, and tonic properties; some are used in medicine; the seeds of some yield useful oil; some are poisonous; some yield pleasant fruits; and the wood of some is valuable. (See CARAPA; MAHOGANY.) The cape ash (*Ekebergia capensis*) deserves notice among the timber trees of this order. It has a trunk 2 feet in diameter and yields excellent tough timber, useful for many purposes. *Melia azedarach*, the familiar chinaberry tree of the southeastern United States, a tree about 40 feet high, with large bipinnate leaves and large spikes of fragrant flowers, a native of Syria and other parts of the East, has long been planted as an ornamental tree in the south of Europe and is now common in California and the southern United States. The fruit is of the size of a cherry, somewhat elongated, pale yellow, when ripe, containing a brown nut. The nuts are bored and strung for beads in Roman Cath-

olic countries, whence the tree is often called bead tree. It is also known as the pride of India and is sometimes erroneously called Persian lilac. The fruit is sweetish, and not poisonous, although generally reputed so. The bark of the root, which is bitter and nauseous, is used as an anthelmintic. The pulp of the fruit of the neem tree or margosa tree (*Melia azadirachta*) yields a bitter fixed oil. The mahogany and Spanish cedar are both members of this family.

MEL'IBŒ'A (Lat., from Gk. Μελίβοια, *Meliboia*). 1. A daughter of Oceanus, and mother, by Pelasgus, of Lycaon. 2. One of the daughters of Niobe.

MELIBŒ'US (Lat., from Gk. Μελίβοιος, *Meliboios*). A shepherd in the first eclogue of Vergil.

MELIBŒUS, TALE OF. A prose tale in Chaucer's *Canterbury Tales*, taken probably from the *Livre de Melibée et de Dame Prudence*, a French rendering of Albertano da Brescia's Latin work, *Liber Consolationis et Concilii*.

MEL'ICER'TES (Lat., from Gk. Μελικέρτης, *Melikertēs*). Son of Athamas (q.v.) and Ino (q.v.), who leaped with him (or his dead body) into the sea. Thereupon both were changed to gods, Ino to Leucothea and Melicertes to Palæmon, who was the guardian of tempest-tossed ships. The Romans identified Palæmon with their god of harbors, Portunus. Palæmon was worshiped at Corinth, especially in connection with the Isthmian Games. (See ISTHMUS.) Story declared that dolphins conveyed the body of Palæmon to the Isthmus; Sisyphus, uncle of Palæmon, conveyed it to Corinth and at the order of the Nereids established the Isthmian Games in his honor. At Tenedos children were sacrificed to Melicertes. It is said that the name is the Greek transcription of the Semitic Melkart (or Moloch), meaning "the king"; at any rate, many have regarded the cult of Melicertes as of Phœnician origin. The Greeks seem rather to have identified Hercules with the Tyrian Melkarth, and, if Melicertes is derived from the Phœnician word, it is more probable that it is the title which Phœnicians gave to the Greek divinity, misunderstood as a proper name by the Greek worshipers. Consult the article "Melicertes" in W. H. Roscher, *Lexicon der griechischen und römischen Mythologie*, vol. ii (Leipzig, 1890–97), and Robert Brown, *Semitic Influence in Hellenic Mythology* (London, 1898).

MEL'IC GRASS (from Neo-Lat. *Melica*, from It. *melica*, great millet, from Lat. *mel*, honey; connected with Gk. μέλι, *meli*, Goth. *meliþ*, honey, OHG. *mili-ton*, AS. *mile-dēaw*, Eng. *mildew*, literally honeydew), *Melica*. A genus of grasses of which nearly half of the species (about 30) occur in the United States. The others are found in temperate climates. They are perennials of small economic importance, with soft flat leaves and rather large spikelets in open or dense panicles. *Melica uniflora* is a common species growing in woods in Great Britain and Europe, and *Melica mutica* and *Melica nitens* in similar situations in the United States. Most of the American species are found from the Rocky Mountains westward.

MEL'ICOC'CA (Neo-Lat., from Gk. μέλι, *meli*, honey + κόκκος, *kokkos*, berry). A genus of trees or shrubs of the family Sapindaceæ, embracing five or six species, one of which, *Melicocca bijuga*, is a native of the West Indies, where it is cultivated for its fruit, known as the honeyberry, Jamaica bullace plum, and genip. It is from 20 to 40 feet high. The fruit is about the size and shape of a plum, yellow or green in color, with a very agreeable flavor. It has been successfully grown in southern Florida and California. The seeds are roasted and eaten like chestnuts. Other species of *Melicocca* yield eatable fruits.

MELIKOV, měl'yĭ-kŏf', LORIS. A Russian soldier and statesman. See LORIS-MELIKOV.

MEL'ILITE (from Lat. *mel*, honey), or HONEY STONE. A complex mineral silicate of sodium, calcium, magnesium, aluminium, and iron, of uncertain formula. It crystallizes in the tetragonal system, has a vitreous lustre, and is white or of light shades of yellow, green, brown, and red in color. It occurs in various igneous rocks, certain varieties of which are known as *melilite basalts*. Melilite is found in Württemberg, Germany, in Italy, the Hawaiian Islands, and in several localities in the United States. It is also produced in furnace slags. The name is also given to a group of minerals including gehlenite.

MELILLA, mā-lē'lyä. A Spanish presidio on the north coast of Morocco (Map: Africa, D 1). It is built on a rocky peninsula extending into the Mediterranean and ending in the Cape of Tres Forcas. It is protected on the land side by a circle of forts, and a citadel commands the harbor, which in 1902 was opened as a port of commerce. Pop., 1910, 39,852, including the Spanish garrison. Melilla was occupied without resistance by the Spaniards in 1496. The Kabyles have made several unsuccessful attempts to capture it, the last being made in 1893, after which a neutral zone was established outside the fortifications. In 1908 a new revolt was brought on by certain mining operations. In 1910 the Riffians having yielded, the Spanish government restarted the mines and undertook harbor improvements.

MEL'ILOT, MELILOTUS (Neo-Lat., from OF. *melilot*, Fr. *mélilot*, from Lat. *melilotos*, from Gk. μελίλωτος, *melilōtos*, μελίλωτον, *melilōton*, a kind of clover, from μέλι, *meli*, honey + λωτός, *lōtos*, lotus). A genus of plants of the order Leguminosæ, natives of the Old World and widely disseminated. The species have upright stems, bear trifoliate leaves resembling those of alfalfa, and small white or yellow flowers from early summer until frost. They often take possession of waste ground, especially if composed largely of clay. All the species contain an ethereal oil known as cumarin, which gives them a strong, peculiar, sweetish odor, especially when drying. The white melilot (*Melilotus alba*), also known as sweet, Bokhara, or tree clover, is a common weedy biennial from 3 to 6 feet high, which is cultivated as a honey plant, and also to some extent for forage. For plowing under as green manure it is of some importance, especially upon heavy soil. Its roots perforate the substratum, and when they decay leave drainage tubes. In this way it may be used two or more years before being turned under as green manure. Another species which has become naturalized in the United States is the common yellow melilot (*Melilotus officinalis*), an annual growing 2 to 3 feet high and occurring in swamps and wet meadows. Its flowers are used in the manufacture of perfumery. The blue melilot (*Melilotus cœrulea* or *Trigonella cœrulea*), a native of northern Africa, is cultivated in Europe, and was formerly much used in medicine as an anodyne.

Melilotus is used for pasturage and for hay.

The green crop, cut when in bloom, has the following average percentage composition: water, 76.5; protein, 2.8; fat, 0.4; nitrogen-free extract, 12.1; crude fibre, 6.6; and ash, 1.6. Melilotus must be cured with care, as too much sun causes shedding of the leaves. At first animals commonly refuse to eat it, but later become used to it; its hay is generally used for home consumption. It is not as salable as other kinds of leguminous hay. Consult: *United States Department of Agriculture, Farmers' Bulletin 485* (Washington, 1912), and *Ohio Agricultural Experiment Station Bulletin 244* (Wooster, 1912). See CUMARIN.

MEL'ILO'TUS. A genus of Leguminosæ (pea family), commonly called sweet clover, because the leaves are fragrant in drying. There are about 20 species, natives of Europe, Africa, and Asia, three of which have become naturalized in the United States, occurring as weeds in waste places and along roadsides. They are *Melilotus alba* (white sweet clover), *Melilotus officinalis* (yellow sweet clover), and *Melilotus indica*, the common names referring to the color of the flowers. The white sweet clover is much the commonest, is coming into use as a forage plant, and is also an excellent bee plant. See MELILOT.

MELIN, mâ-lēn', KARL ALFRED (1849–). A Swedish author, born at Utö and educated at Stockholm and Upsala (Ph.D., 1875). He published several collections of poems which became popular, among them *Humleplockningen* (1882), *Princessen och svennen* (1885), a fairy poem in the style of old country ballads, *Dikter* (1888), *Skärgårdsbilder* (1891), and a new collection of *Dikter* (1904), all of which show lyric talent. In the field of drama he wrote *Vid Breitenfeld* (1893) and *Snöhvit* (1897). His stories *De svarte vikingarnas saga* (1910) and *Tjuvbandet i Dagö skärgård* (1911) are favorites among young people. In 1898 Melin became a member of the Academy and in 1903 a member of the committee for the award of the Nobel prize.

MÉLINE, mâ'lēn', FÉLIX JULES (1838–). A French statesman. He was born at Remiremont, studied law in Paris, and in 1860 was admitted to the bar. His earliest political activity was in the democratic opposition to the Empire. In 1871 he refused an election to the Commune, but in the following year was returned to the National Assembly, where he upheld Thiers and became a member of the Republican Union. For a few months in 1879 he was Undersecretary of State in Jules Simon's cabinet, and in 1880 made himself prominent by his able advocacy of the policy of protection. From 1883 to 1885 he was Secretary of Agriculture in Ferry's cabinet. Three years afterward, as President of the Chamber of Deputies, Méline carried through his great protective measure which went into force in 1892. Méline refused to form a ministry in 1893; undertook the management of the *République Française*, which he carried on until 1896; and in the winter of 1894 was reëlected President of the Chamber. In 1896 he was made Prime Minister by Félix Faure and again took the portfolio of Agriculture. The May elections of 1898 forced the cabinet out, however, and Méline returned to the Chamber of Deputies. There he acted as the leader of the Conservative branch of the Republican party in opposition to the Radical wing, which, with the aid of the Socialists, had come into power under Waldeck-Rousseau. In 1899 he was a candidate for the presidency of France. During the Dreyfus affair he was considered as an opponent of the accused captain and for that reason lost his political influence. After 1903 he was a member of the Senate from the Department of the Vosges. He founded the Society for Agricultural Merit and wrote *Le retour à la terre et la surproduction industrielle* (3d ed., 1905).

MÉLINGUE, mâ'lăng', ETIENNE MARIN (1808–75). A French sculptor and actor, born at Caen. He worked as a sculptor on the ornaments of the church of the Madeleine, Paris, at an early age, but soon went on the stage. After playing with a touring company he attained distinction at the Porte St. Martin in *Les sept infants de Lara, Les mousquétaires, La reine Margot, Monte Cristo, Fanfan la tulipe, La dame de Montsoreau*, and *Le Bassu*. In *Benvenuto Cellini* he displayed his talents both as an actor and sculptor. His sculptures include: "Francis I," "M. Duprez as William Tell," "Rabelais," "Satan," "Histrion," and "Œneïs." His wife was the actress Théodorine Thiesset (1813–86).

MEL'INITE. Fused picric acid (melting point 122.5° C.), used in France as a bursting charge for armor-piercing shells, it having been found by Turpin that such a charge could be caused to detonate violently by the detonation of a primer of guncotton in contact with it. In England this bursting charge, made as described above, was styled lyddite. Turpin's original melinite (1886) consisted of picric-acid crystals cemented into cartridges by collodion. See EXPLOSIVES.

MELIS'MA (Neo-Lat., from Gk. μέλισμα, song, from μελίζειν, *melizein*, to sing, from μέλος, *melos*, song). A term applied in modern music to melodic groups of notes executed upon one syllable of a word. It is particularly employed to give Oriental color. The songs of Rubinstein dealing with Oriental subjects (*Der Asra*), Verdi's *Aïda*, and Goldmark's *Königin von Saba* offer fine examples of melismatic writing.

MELIS'SA. A genus of plants. See BALM.

MELISSA. 1. In Greek mythology, a nymph by whom the use of honey was said to have been discovered, whence bees were called μέλισσαι. The actual derivation is from μέλι, honey. 2. The daughter of Procles and wife of Periander, who, in jealousy, killed her by a blow while she was with child. 3. In Ariosto's *Orlando Furioso*, a kindly fairy who protects Rogero and Bradamant (q.v.).

MEL'ITA. The Latin name of Malta (q.v.).

MEL'ITO, SAINT (Lat., from Gk. Μελίτων, *Melitōn*). Bishop of Sardis, in the second half of the second century. He is mentioned by Eusebius as an upholder of Catholic orthodoxy, and is known to have written many works, only fragments of which are extant. Among those mentioned by Eusebius are an *Apologia* addressed to Aurelius concerning the paschal controversy, and *Eclogæ*, containing the first Christian catalogue of "the books of the Old Covenant." Consult: Otto, *Corpus Apologetarum Christianarum Sæculi Secundi*, vol. ix (Jena, 1842–72); Adolf Harnack, *Texte und Untersuchungen*, vol. i (Leipzig, 1882); the translation in the *Ante-Nicene Fathers*, vol. viii; Adolf Harnack, *Geschichte der altchristlichen Literatur* (Leipzig, 1893).

MELITOPOL, mā'lē-tŏ'pŏl-y'. A town in the Government of Taurida, south Russia, situated

on the river Molótchnaya, 150 miles north-northeast of Simferopol (Map: Russia, E 5). It has a Gymnasium and a Realschule and carries on some trade in agricultural products and salt. It was founded in the beginning of the nineteenth century. Pop., 1897, 15,120; 1910, 18,519.

MEL'ITOSE and **MEL'ITRI'OSE.** See SUGARS.

MELITZASE. See ENZYME.

MELK, HEINRICH VON. See HEINRICH VON MELK.

MEL'KARTH. A Phœnician divinity identified by some with the Greek Melicertes (q.v.). He was the special god (Baal, q.v.) of Tyre, where he had a magnificent temple. He represents the old Chaldæan sun hero and god of navigation. Because of his adventures, strength, and labors the Greeks identified him with Hercules (q.v.); on later Greek coins Baal-Melkarth is frequently represented as Hercules.

MEL'LEN, CHARLES SANGER (1851–). An American railroad president, born at Lowell, Mass. After a public-school education he entered railroad work as a clerk in the cashier's office of the Northern New Hampshire Railroad in 1869, and did other clerical work on that railroad and the Central Vermont until 1880. He was assistant to the manager (1880–81), auditor (1881–83), superintendent (1883–84), and general superintendent (1884–88) of the Boston and Lowell and the Concord railroads; served as general purchasing agent (1888), assistant general manager (1888–89), and general traffic manager (1889–92) of the Union Pacific System; and for four years was general manager of the New York, New Haven, and Hartford Railroad. After serving as president of the Northern Pacific from 1896 to 1903, he was head of the New Haven in 1903–13 and of the Boston and Maine in 1910–13. He incurred much criticism because of the alleged effort which the road made to secure a monopoly of transportation lines in New England, and because of a defectiveness of organization, administration, and equipment which made possible an unusual succession of wrecks. In 1915 he announced his retirement from all business interests.

MELLIN DE SAINT-GELAIS. See SAINT-GELAIS, MELLIN DE.

MELLO, mäl'lô, CUSTODIO JOSÉ DE (c.1845–1902). A Brazilian admiral. Having entered the navy and attained the rank of admiral, he came into political prominence, upon the establishment of the Republic, as a deputy in the national Congress. Attached to the federalist group, he opposed the dictatorial policy of President Fonseca and aided in the latter's overthrow (1891). He then became Minister of Marine, but when President Peixoto's actions indicated his intention to maintain himself in the position of a dictator, Mello resigned his position, issued a long pronunciamento (Sept. 6, 1893) embodying the charges against the administration, and took command of the revolt of the navy. The revolt had little chance of success, for it was not supported by an army. The navy bombarded Rio de Janeiro from time to time, but was prevented from doing much damage because of the opposition of the Powers, especially the United States, which refused to recognize the rebels as belligerents or allow any interference with commerce. Leaving the fleet, Mello went south, hoping to effect a conjunction with the revolt under Gumercindo Saraiva in Rio Grande do Sul. Having conferred with the provisional government at Desterro, Mello conducted a successful expedition against Paranaguá, but he failed to take sufficient reënforcements back to Rio de Janeiro to bring success to the rebel cause. When he received news that Admiral Saldanha da Gama (q.v.) had surrendered the navy at Rio de Janeiro to Peixoto's new fleet Mello gave himself up to the Argentine authorities in April, 1894. He maintained that his sole purpose was to purify the Republic, but in 1901 he was suspected of being implicated in an Imperial plot and was arrested and confined on the island of Cabras.

MELLO, or **MELO,** FRANCISCO MANOEL DE (1611–66). A Portuguese poet and historian, born at Lisbon of a noble family and there trained in the humanities by the Jesuits. He became an army officer, first serving with the Spanish fleet, and for 10 years having a varied experience in Spain, Portugal, and Flanders in many positions of importance, and being commissioned to write the *Historia de la guerra de Cataluña,* a war in which he took part. Later we find him in the Portuguese service when his native country asserted its independence. Despite his loyalty, he was imprisoned by order of John IV on a false charge of attempted assassination made by the jealous Count of Villa Nova, and, after an incarceration that lasted from 1644 to 1653, he was banished to Brazil. There he remained six years, until the death of the monarch permitted his return to Portugal. From 1659 to 1663 he spent most of his time in Lisbon, where he frequented the Academia dos Generosos, whose president he was for five elections. Mello is one of the best Portuguese poets of the seventeenth century, commendably free from most of the mannerisms of the time. His numerous poetical compositions, first collected under the title of *Las tres musas de melodino* (1649), which contains only his Spanish verses, were later published as *Obras métricas* (Lyons, 1665) and included his Portuguese poems. These latter reveal him as a true poet and are not without popular and patriotic elements. Of Mello's other works in Portuguese may be mentioned certain prose compositions: the *Hospital das lettras,* a dialogue containing much sound literary criticism; the *Apologos dialogaes* (1721); and the *Carta de guia de casados* (1651), in which the author gives a picture of Portuguese family life of the period. Not the least meritorious of Mello's productions is the previously mentioned historical work, *Historia de los movimientos, separación, y guerra de Cataluña* (1645), which is in Spanish. An historical treatise in Portuguese is the *Epanaphoras de varia historia portugueza* (1660).

Bibliography. The *Obras metricas de D. Francisco Manoel* and his *Obras* in general (Lyons, 1665); the verse comedy *Auto do Fidalgo Aprendiz* in the *Musas,* and also separately in 1676, cf. T. Braga in his *Theatro portuguez no seculo XVII* (Lisbon, 1870–71); also I. F. da Silva, *Diccionario bibliographico portuguez* (ib., 1858 et seq.); P. Chasles, *Voyages d'un critique* (Paris, 1869); Branco in the edition of the *Carta de guia de casados* (Oporto, 1873); Edgar Prestage, *Don Francisco Manuel de Melo, esbozo biografico* (Coimbra, 1914). For a discussion of Mello's prose style: Melo, *Carta de Guia de Casados,* edited by C. Castello Branco (Lisbon, 1898); Georges Cirot, in *Mariana, historien* (Bordeaux, 1905); Melo, *His-*

toria de los movimientos, separación y guerra de Cataluña, edited by J. O. Picón (Madrid, 1912).

MELLONE, měl-lōn′, SYDNEY HERBERT (1869–). An English Unitarian educator, son of an Irish clergyman. He was educated at University College, London, at Edinburgh University, and at Manchester College, Oxford. From 1898 to 1909 he was minister of the First Presbyterian (Unitarian) Church, Holywood, County Down, and in 1909–11 of St. Mark's Chapel, Edinburgh. He then became principal of the Unitarian Home Missionary College, Manchester. He contributed to Hastings, *Encyclopædia of Religion and Ethics* and published: *Studies in Philosophical Criticism and Construction* (1897); *Leaders of Religious Thought in the Nineteenth Century* (1902); *Text Book of Logic* (1903; 6th ed., 1913); *Elements of Psychology* (1907; 2d ed., 1910), with Miss Margaret Drummond; *Laws of Life* (1908); *The Immortal Hope* (1911).

MELLONI, měl-lō′nē, MACEDONIO (1798–1854). An Italian experimental physicist, famous for his researches on the subject of radiant heat. He was born in Parma. In 1824 he was called to the chair of natural philosophy in the University of Parma. Banished from Italy, he was a professor in the Department of the Jura until his return in 1839, when he became director of the cabinet of arts and trades in Naples. He was appointed by the King of Naples director of the meteorological observatory on Mount Vesuvius (1839). In the same year he was elected a member of the Royal Society. He discovered the existence of heat in lunar light, and was a pioneer worker in the field of radiant heat. Realizing the identity of radiant heat and light, he investigated the transparency of various substances to radiant heat and first used the word diathermancy (q.v.) to express this property. He successfully developed the use of the thermopile for heat measurements. Melloni published numerous memoirs on various topics in natural philosophy, and the unfinished book *La thermochrose, ou la coloration calorifique* (1850). Consult biographical sketch by J. Lovering in *Proceedings of the American Academy of Arts and Sciences*, vol. iii (1857), and S. P. Langley, *Address before American Association for the Advancement of Science* (1888).

MEL′LON INSTITUTE OF INDUSTRIAL RESEARCH. An integral part of the University of Pittsburgh (q.v.), but possessing an endowment of its own, totaling over half a million dollars. The system of coöperation between science and industry, founded by Robert Kennedy Duncan, forms the basis of the work of the institute. According to this system, an individual or a company having a problem requiring solution establishes a fellowship by contributing to the institute a definite sum of money for a period of not less than one year; the money is used to pay the salary of the man or men selected to carry out the investigation desired, while the institute furnishes all necessary laboratory facilities and guidance in the work. The results obtained become for the time being the property of the donor of the fellowship. The present director is Dr. Raymond F. Bacon, and at the present time 40 research chemists are engaged in the study of 23 different industrial problems. In 1915 a department of research and graduate instruction in pure chemical science was established within the institute and placed under the direction of Dr. M. A. Rosanoff (q.v.). The expenditure for salaries and maintenance amounted to over $150,000 in 1914. The institute occupies a building specially designed for its needs and erected at a cost of $350,000.

MEL′MOTH, COURTNEY. The pen name of the English miscellaneous writer Samuel Jackson Pratt (q.v.).

MELO. See MELLO.

MELOCRINUS, mē-lŏk′rĭ-nŭs. A genus of crinoids with large, melon-shaped, many-plated calyx and biserial arms, found in the Silurian of Europe and especially in the Devonian of eastern North America. It furnishes some of the most beautiful fossil forms, as *Melocrinus nobilissimus*. It was formerly known as *Mariacrinus*. See CRINOIDEA.

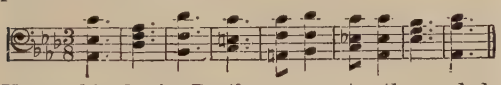
MELO′DEON. The early American organ, in which an exhaust or suction bellows draws the air inward through the reeds. About 1836 J. Carhart made a number of improvements in the melodeon, and upon the application of still further inventions by E. P. Needham and E. Hamlin the instrument became widely popular. The supply of wind for the reeds is obtained by means of a pair of treadles worked by the performer, and the reeds themselves are controlled by stops and slider mechanism. The tone of the instrument has been steadily improved, and now successfully imitates a number of orchestral instruments. See HARMONIUM; ORGAN.

MELODRAMA, měl′ŏ-drä′mȧ (from Gk. *μέλος, melos*, song + *δρᾶμα, drama*, action, play). Properly a half-musical drama, or a dramatic performance in which the dialogue is interspersed with music. Rousseau's *Pygmalion* is commonly cited as the first French melodrama, and some of the earlier English operas are of this type. In Italy, however, the name was first applied to the opera by its inventor, Ottavio Rinuccini, near the end of the sixteenth century. In Germany the term has been particularly used to designate a declamation with instrumental accompaniment (as distinguished from the *recitative*, which is characteristic of the regular *opera*, q.v.). The object of the music is to intensify the emotions evoked by the spoken words, which may be a poem like Schiller's *Lied von der Glocke* or a regular drama; but the æsthetic value of the practice has been much disputed and it has almost fallen into disuse in serious works. At present the word is commonly used to designate the type of play which depends for its interest on sensational incidents and extravagant situations rather than on a truthful representation of life. This use of the word appears to have originated in France, where, in the latter part of the eighteenth century, it came to be applied to the style of popular tragedy in which were presented the conventional types of stage villains, persecuted innocent heroines and their kind, along with elements of comedy as well as of music and dancing, and with a regularly happy ending in deference to well-known popular preferences in this respect.

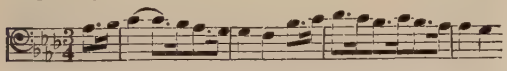
MEL′ODY (Lat. *melodia*, Gk. *μελῳδία*, from *μέλος, melos*, song + *ᾠδή, ōdē*, song). A succession of tones constituting a musical phrase. That this succession be pleasing is not absolutely essential. Whereas harmony considers all the tones sounded simultaneously in the various voices or parts, melody primarily considers the various tones of only a single voice or part, i.e., in relation to every preceding or succeeding tone. Broadly speaking, it has been stated that a

melody rising in pitch corresponds to the more violent emotions, such as determination, desire, longing, striving; while a melody falling in pitch corresponds to the more passive states, as resignation, contemplation, sadness. But in reality a melody can never be considered absolutely by itself. The character of every musical phrase is determined by a combination of three vital and fundamental elements, melody, harmony, and rhythm, each of which affects the others. This is easily seen by examining any of Wagner's leading motives, where the same melodic phrase is rendered capable of great emotional variety by changes in the harmonic or rhythmic elements. In fact, the same succession of notes may sound noble or trivial according to the choice of refined or commonplace harmonies supporting it. There is an endless variety in the succession of musical tones forming a melody, some being so easily intelligible that even people of little musical taste can distinguish them, as is the case with some popular dance forms. The term "melody" is by no means synonymous with *cantilena*, as many seem to think. The former term is infinitely broader than the latter. No special course in melody is given in conservatories, although in recent years several theoretical treatises on the subject have appeared. The pupil almost unconsciously acquires the practical elements of melodic formations while pursuing the study of harmony and the higher forms of composition.

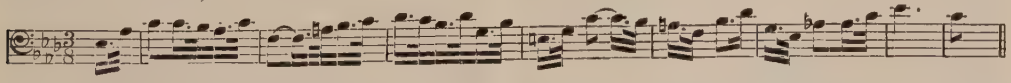
Upon any harmonic basis a practically endless number of melodies may be written, and, vice versa, all melodies can be reduced to a simple harmonic basis. To illustrate this let us take the opening theme of the famous andante of Beethoven's Fifth Symphony. The harmonic plan is as follows:



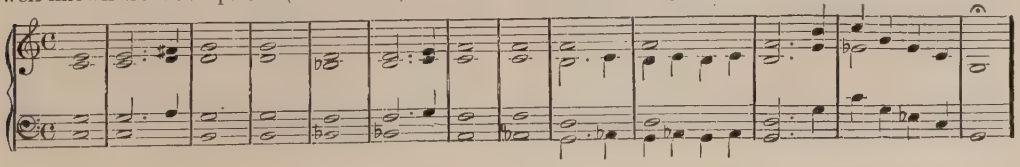
Upon this basis Beethoven wrote the melody originally in this form:



When he came to write the full score the master felt that his theme was commonplace. By retaining the harmonic basis and only altering the melodic intervals the following noble melody, such as we know it, arose:

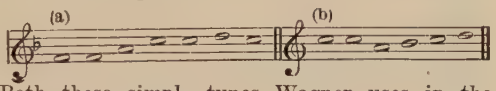


The following is a reduction to the simplest harmonic basis of the principal themes of the well-known Sonata op. 53 (Waldstein):

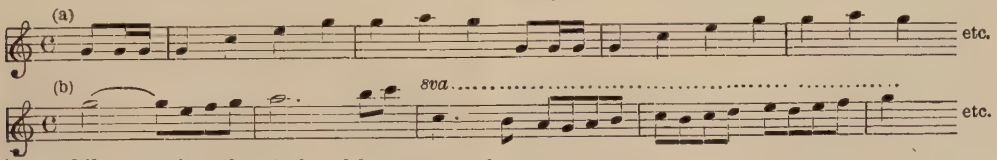


Comparing this with the original, it will be seen how Beethoven constructs his melody. The reader should examine in the score the successive melodic changes which the theme of the third example undergoes in the course of the movement. Wagner in the prelude to *Die Meistersinger* reduces the Mastersinger's motive and the second theme from Walter's Prize Song to a common harmonic basis (slightly different from that of either of the themes in its original form), and thus is enabled to make both themes resound simultaneously on different instruments. (Piano score, p. 7.) Without making the slightest alteration in Bach's C major prelude from the *Well-tempered Clavichord*, Gounod writes an additional melody to the harmonic basis, which has become famous as Gounod's *Ave Maria*.

The following examples show how a mere succession of intervals can be changed by the infusion of the rhythmic element into a distinctive melody. In Wagenseil's book, *Von der Meistersinger holdseligen Kunst*, we find the following two tunes of prize-crowned master songs:



Both these simple tunes Wagner uses in the Processional March of *Die Meistersinger*, where they occur in these forms:



All melody can be conceived as a rhythmic evolution from a succession of intervals in notes of equal value, and, vice versa, all melodies can be reduced to a monotonous succession of intervals. It is the composer's individual genius that imparts its character to each melody. Within recent years several theorists have attempted a scientific exposition of the principles of melodic formations with practical hints towards their invention. Among the best works of this kind are: Bussler, *Elementarmelodik* (Berlin, 1879); Riemann, *Neue Schule der Melodik* (Hamburg, 1883); E. Cremers, *L'Analyse et la composition mélodique* (Paris, 1898).

MEL'OGRAPH (from Gk. μελογράφος, *melographos*, song writing, from μέλος, *melos*, song + γράφειν, *graphein*, to write). A mechanical device for making a record of music as it is played on a pianoforte. It is supposed to reproduce on paper, by means of characters, all the notes struck on the keyboard (with their duration), so that there may be a readable record of any music which a player may improvise. Since 1747 numerous melographs have been patented, but with the exception of Fenby's "electric melograph" or "phonautograph" none

has given lasting satisfaction. In the phonautograph under each key is placed a stud; when the key is depressed an electric connection is formed, and the particular note struck and its duration are recorded on paper. All these devices were superseded by the invention of Edison's phonograph (q.v.).

MELOIDÆ, mē-lōĭ-dē. A family of moderate-sized beetles, with the head constructed behind the eyes, the prothorax at its hinder edge narrower than the elytra, the legs long, with front haunches large and conical, the feet with the last segment but one not bilobed, and the claws split to the base. The larvæ of several undergo metamorphosis (q.v.); and most of the species exude an odorous oil, highly serviceable in medicine. Consult: Le Conte, "Synopsis of the Meloids of the United States," in *Proceedings of the Academy of Natural Science*, vol. vi (Philadelphia, 1853); Horn, "Revision of the Meloidæ of the United States," in *Proceedings of the American Philosophical Society*, vol. xiii (ib., 1873); id., "Studies among the Meloidæ," in *Transactions of the American Entomological Society* (ib., 1885).

MEL'ON (OF. *melon, millon*, Fr. *melon*, from Lat. *melo*, for *melopepo*, from Gk. μηλοπέπων, *mēlopepōn*, melon, from μῆλον, *mēlon*, apple + πέπων, *pepōn*, melon, so called from the shape). The plants and fruits of *Cucumis melo* and *Citrullus vulgaris* of the family Cucurbitaceæ. See MUSKMELON; WATERMELON.

MELON CATERPILLAR MOTH. See MELON INSECTS.

MEL'ONECHI'NUS (Neo-Lat., from Gk. μῆλον, *mēlon*, apple + ἐχῖνος, *echinos*, the sea urchin). A fossil sea urchin found in the Sub-Carboniferous rocks of North America and Europe. The test is melon-shaped with vertical grooves, is 4 to 6 inches in diameter, and made up of numerous thick hexagonal or pentagonal plates that are regularly arranged in vertical series and that are covered by minute tubercles and small needle-like spines. Large slabs of limestone on the surfaces of which are several finely preserved specimens of this sea urchin have been obtained from the vicinity of St. Louis, Mo. See ECHINODERMATA; SEA URCHIN.

MEL'ON INSECTS. Most of the insects which attack melons also feed upon certain other cucurbitaceous plants. Thus, the squash-vine borer (*Melittia ceto*) also bores in the stems of melons. The striped squash beetle (*Diabrotica vittata*) also feeds upon the leaves of melons, as does the cucumber flea beetle (*Crepidodera cucumeris*). The melon caterpillar (*Margaronia hyalinata*) is a widely distributed insect found through the greater part of North and South America, and is particularly destructive in the southern part of the United States. The caterpillars of the first generation feed upon the leaves and those of the second generation eat into the fruit of melons, cucumbers, and pumpkins. The wings of this moth are pearly white with a peculiar iridescence, are bordered with black, and measure about an inch from tip to tip. A similar and closely related caterpillar, the larva of *Margaronia nitidalis*, also feeds in the fruit of melons and cucumbers. Poisoning the foliage with some arsenical mixture to destroy the larvæ of the first generation is the standard remedy. The melon plant louse is perhaps the most destructive insect enemy of this plant. This insect has a wide range of food plants, but is an especial enemy of melons, and feeds on the undersides of the leaves. Underspraying with a kerosene-soap emulsion is the only remedy in large fields, but in small gardens carbon disulphide may be used under inverted tubs or paper coverings. See Colored Plate of MOTHS, AMERICAN.

MELONITES, mĕl'ō-nī'tēz. See MELONECHINUS.

MEL'ON TREE. See Plate of PAPAW.

ME'LOS (Lat., from Gk. Μῆλος), or MILO. The southwesternmost island of the Cyclades in the Ægean Sea, about 70 miles northeast of Crete and 65 miles east of the Peloponnesus (Map: Greece, Ancient, D 3). It is 14 miles long and 8 broad, with an area of 52 square miles, and has on its northern coast one of the best and safest natural harbors in the Levant. The island is crescent-shaped and seems to be part of the rim of the crater of an old volcano. The highest eminence is Mount St. Elias (2539 feet), in the southwestern part. The island shows many traces of its volcanic character and contains hot mineral springs and considerable deposits of sulphur. The soil is fertile and produces good crops of grain, especially barley, as well as wine and oil. Salt, gypsum, and millstones are exported. The chief town is Plaka, in the northern part of the island near the site of the ancient capital, Melos, of which extensive remains are to be seen. Near the sea the ground is marshy, and the air is unwholesome in summer. In prehistoric times the island seems to have been of some importance, on account of the obsidian found in its rocks, used in the Stone age for knives and arrowheads. The chief settlement was on the northeast coast near the modern Phylakopi, where are remains of three successive towns, extending from the Stone age to the end of the Mycenæan period. There are traditions of Phœnician occupation at a later time, but during the classical period Melos was inhabited by Dorians, and during the Peloponnesian War was one of the few islands not in the Athenian League. Though the inhabitants were willing to remain neutral, the Athenians in 416 B.C. seized the island, killed the men and sold the women and children into slavery. With the fall of Athens, however, the Athenian colonists were expelled by Lysander, and the former inhabitants were brought back so far as possible. Melos fell successively under the dominion of the Romans, the Byzantine emperors, Venice, and the Turks; it is now a part of Greece. During the later classical period the island evidently enjoyed considerable prosperity and was enriched with many works of art, some of which have been recovered from time to time. Notable among these are the fine "Poseidon" in the National Museum at Athens, the Asclepius now in the British Museum, and especially the "Venus of Milo," discovered in 1820 by a peasant, and now one of the chief treasures of the Louvre. From 1896 to 1899 excavations were conducted on the island by the British School at Athens, on the site of the ancient town of Melos, which led to the discovery of the hall of the "Mystæ," or "Initiated," and some foundations at the site of the ancient capital, near the modern village of Klima on the great bay. A theatre of Roman date, parts of the walls of the town, and houses of Greek times were also discovered. The chief result, however, was the recovery of the prehistoric settlements at Phylakopi, with a wealth of early pottery and some very interesting frescoes.

Bibliography. The reports of the excavations may be found in the *Annual* of the British School at Athens, vols. ii–v (London, 1897–1900), and the *Journal of Hellenic Studies*, vols. xvi–xix (ib., 1896–99); "Excavations at Phylakopi," in *Hellenic Society, Supplementary Papers*, vol. iv (London, 1904); *Annual of the British School at Athens*, vol. xvii (London, 1910–11). See VENUS OF MELOS.

MELOS (Neo-Lat., from Gk. μέλος, song). A musical term denoting the continuity of the melodic outline in any single movement of a composition. A symphonic movement, e.g., consists of several themes complete in themselves. In the movement, however, they do not appear as so many independent musical phrases with a full cadence, but follow one another in a certain order, one leading either directly or by means of a transition passage into the next, so that their connection, unbroken by any full cadence, forms a continuous melodic chain from the first bar to the last. This chain or aggregate of melodic phrases constitutes the *melos* of the movement. The term "melos" was first used in this sense by Wagner in his theoretical works. Every act of his musical dramas resembles a symphonic movement insomuch that the melodic outline is never interrupted by a full cadence. The leading motives are treated and developed exactly like the themes in a symphony. Wagner is, therefore, justified in speaking of his "endless melody." In the opera every number closes with a full cadence. An act consists, therefore, of a collection of several numbers, each complete in itself, having no connection whatever with the preceding or following number. Although each number has its melos, the act can have none, and consequently no artistic unity, because the fundamental principle of unity is continuity. See also LEITMOTIV; MUSICAL DRAMA; RECITATIVE.

MELO'SA. A Chilean plant. See MADIA.

MELOZZO DA FORLÌ, mâ-lōt'sô dà fôr-lē' (c.1438–94). An Italian painter of the early Renaissance, born at Forlì. He was a pupil of Piero della Francesca, who was then at the height of his fame, and worked with him in the castle of Urbino for Duke Federigo di Montefeltro. Melozzo was also introduced to the notice of Pope Sixtus IV and became a favorite painter. For this Pope and his nephew, Cardinal Riario, he executed his two great frescoes, "An Audience of Sixtus IV" for the Vatican Library, and an "Ascension" for the cupola of Santi Apostoli. The first of these has been transferred to canvas and is in the Vatican Gallery; the latter is in fragments, the figure of Christ being in the Quirinal and "Angels Making Music" in the inner sacristy of St. Peter's. The latter, with their majestic forms, glowing vitality, and rapt personality, are among the most exquisite examples of early Italian art. The whole work shows that Melozzo understood foreshortening, a part of perspective then little studied. His "Pesta Pepe" fresco, in the Pinacoteca at Forlì, representing an apothecary's apprentice pounding herbs, also furnishes an example of his strong feeling for tactile values and movement. The series of fine frescoes representing "Prophets and Angels" and the "Entry into Jerusalem" for the Casa Santa at Loretto were executed after his designs almost entirely by Palmezzano. Many other paintings are now doubtfully attributed to him, notably the fresco of "The Arts and Sciences" for the ducal library at Urbino, portions of which are in London and Berlin, in which he is thought to have collaborated with Joos van Ghent. Consult: A. Schmarzow, *Melozzo da Forlì* (Stuttgart, 1886); Bernhard Berenson, *Central Italian Painters of the Renaissance* (New York, 1903); Ricci, *Melozzo da Forlì* (Rome, 1911); A. Schmarzow, *Joos van Ghent und Melozzo da Forlì* (Leipzig, 1912).

MELPOMENE, mĕl-pŏm'ĕ-nē (Lat., from Gk. Μελπομένη, the singing one, pres. pt. of μέλπεσθαι, *melpesthai*, to sing). In Grecian mythology, one of the nine muses. When to the individual muses specific functions were assigned, Melpomene was called the muse of tragedy. In ancient art she was represented with a mask in her right hand and a roll of a part of a play in her left. See MUSES.

MEL'ROSE. A village of Roxburghshire, Scotland, on the Tweed, at the foot of the Eildon Hills, 37 miles southeast of Edinburgh (Map: Scotland, F 4). It is a popular resort with a hydropathic institute. It is noted for the remains of its Cistercian abbey, celebrated in history and literature, and the finest Gothic ruin in Scotland. Its erection dates from 1326, after the destruction by the English in 1322 of the Abbey of the Virgin Mary built by David I between 1126 and 1146 at Old Melrose on a promontory overlooking the river 2 miles to the northeast. The abbey was built from a fund supplied by King Robert Bruce and his son David II and was not finished until the middle of the sixteenth century. It was much mutilated and despoiled by the English in 1385 and in 1545. The present remains are the major portions of the abbey church, the choir, the transept, part of the nave, and the southern aisle with its eight small chapels, and fragments of the cloister, a square of 150 feet. The church is 258 feet long, width of transept 115 feet, height of central square tower 84 feet. It is a composite of late flamboyant Gothic architecture, rich in elaborate ornamentation; traceried windows, shafts, capitals, vaultings, and flying buttresses being its distinctive features. Abbotsford (q.v.), the home of Sir Walter Scott, is about 3 miles south of Melrose Abbey. Pop., 1901, 2195; 1911, 2166.

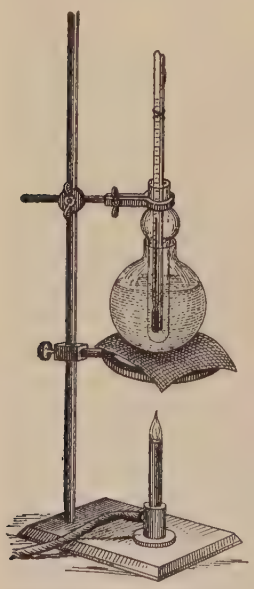
MELROSE. A city, including the villages of Melrose Highlands, Fells, and Wyoming, in Middlesex Co., Mass., 7 miles north of Boston, on the Boston and Maine Railroad (Map: Massachusetts, E 3). It is an attractive and popular residential suburb of Boston, has a public library, hospital, and public parks, and engages in some manufacturing, the principal products being rubber boots and shoes. Noteworthy features are Middlesex Fells, a State reservation of 1800 acres, and a large natural reservoir, Spot Pond. The government is administered, under the charter of 1900, by a mayor, annually elected, and a board of aldermen, one-third of whose members are elected at large. The board elects the city clerk, treasurer, auditor, and collector, and confirms the executive's nominations of other subordinate officials. The school board is independently chosen by popular vote. Pop., 1900, 12,962; 1910, 15,715; 1914, 16,887; 1920, 18,204. Melrose was settled probably as early as 1633, and formed a part of Charlestown until 1649, and of Malden from 1649 until Melrose was incorporated in 1850. In 1900 it received a city charter. Consult S. A. Drake, *History of Middlesex County*, vol. ii (Boston, 1880), and E. H. Goss, *History of Melrose* (Melrose, 1902).

MELROSE. A city in Stearns Co., Minn., 100 miles northwest of St. Paul, on the Great Northern Railroad (Map: Minnesota, C 5). There are granite works, flour and planing mills, and a brewery. The water works and electric-light plant are owned and operated by the city. Pop., 1900, 1768; 1910, 2591.

MELROSE PARK. A village in Cook Co., Ill., 12 miles west of Chicago, on the Chicago and Northwestern and the Indiana Harbor Belt railroads (Map: Illinois, J 2). It is a residential place, but has some industries, including the manufacture of malleable iron and milk cans and the quarrying of stone. There are municipal water works. Pop., 1900, 2592; 1910, 4806.

MELSTED, měl'stĕd, HENNING FINNE VON (1875–). A Swedish author, born in Stockholm. He was educated there and at Upsala, practiced law, traveled in England, Germany, France, Spain, and Italy, and then turned to literature. After two anonymous stories, *Georg Dahna* (1898) and *Leo Dahna* (1899), his collection of tales, *Noveller i dialog* (1901), attracted attention, as did the drama *Starkare än Lifvet—Brottningar* (1902) and the romances *Kärleksresa* (1902), *Stormtider* (1903), and *Nöd* (1904), a novel. He wrote also the romances *Kvinnoöden* (1905), describing life among the higher classes in Stockholm; *Fantomen* (1906); *Milla* (1907); *Fariséens hustru* (1908); *Passionsnoveller* (1908); *Damen utan nåd* (1909); *Juristerna* (1910), describing Swedish sentiment in the crisis of 1905. Melsted is considered one of the ablest prose writers of modern Sweden.

MELTING POINT. The temperature at which a given substance passes from the solid into the liquid state. Different substances generally have different melting points. Thus, mercury if solidified by cold would melt at a temperature of 40° below 0° C. (— 40° F.); ordinary ice (see ICE) melts at 0° C. (32° F.); sulphur at 115° C. (239° F.); tin at 230° C. (446° F.); lead at 324° C. (615° F.); zinc at 418° C. (784° F.); aluminium at 727° C. (1341° F.); silver at 968° C. (1774° F.); gold at 1072° C. (1862° F.); copper at 1082° C. (1980° F.); pure iron at 1505° C. (2741° F.); platinum at 1777° C. (3231° F.); etc. The presence of more or less impurity in a given substance generally causes a corresponding depression of its melting point, and hence the latter is often determined when it is required to ascertain whether a given substance, especially a carbon compound of known melting point, is perfectly pure. Such determinations may be conveniently carried out by means of the apparatus shown in the accompanying figure.



MELTING-POINT APPARATUS.

The apparatus consists of an ordinary round-bottomed flask of about 250 cubic centimeters' capacity, with the greater part of the neck cut off; in this is an ordinary test tube widened in one place so as to be readily held by the flask without touching its bottom; both contain, to about the same level, some liquid (say, strong sulphuric acid) that may be heated to a somewhat high temperature without boiling. To carry out a determination, a small amount of the given substance is introduced into a capillary tube of glass, the latter is tied on to a thermometer so that the substance is very near the mercury bulb, the thermometer with the capillary tube is immersed in the liquid of the test tube, the temperature is allowed to rise very slowly, and the point is carefully noted at which the contents of the capillary tube begin to change color and become transparent. For very precise determinations, however, this method should not be employed. Instead, the investigator uses much larger quantities of substance, reduces the latter to a fine powder, and immerses the thermometer directly into it. While it is known that different modifications of one and the same chemical substance may have different melting points, and hence the melting point cannot be considered as strictly characteristic of a given chemical species, it is so easy to determine with great precision, that it is considered as one of the most useful constants and is very frequently employed by chemists for the purpose of identifying substances and, as already mentioned, for the purpose of testing their purity. Further, in spite of but too many exceptions, certain interesting relations have been shown beyond doubt to exist between the melting points of organic substances and their molecular weights and constitution. See article BOILING POINT.

Under FREEZING POINT that point has been defined with reference to the vapor tension of the given substance in the solid and liquid states. The same definition, and for precisely the same reasons, is of course applicable to the melting point. Concerning the "latent heat of fusion," see FREEZING MIXTURES; HEAT.

Influence of External Pressure on Melting Points. Strictly speaking, the melting point of a solid substance, just as the boiling point (q.v.) of a liquid, depends upon the external pressure. In the case of the melting point, however, the influence exercised by the external pressure is so slight that it may generally be safely left out of account altogether. The subject was first theoretically investigated, from the standpoint of thermodynamics, by James Thomson, and later by Clausius, who found that for a given substance the change of melting temperature caused by an increase of one atmosphere in pressure must be represented by the formula,

$$\frac{T(V - V')}{r},$$

where T denotes the melting point (on the absolute scale, i.e., the centigrade temperature increased by 273) corresponding to some given pressure; V denotes the volume occupied by one gram of the liquid substance at the melting temperature; V' denotes the volume occupied by one gram of the solid substance at the same temperature; and r denotes the mechanical equivalent (in terms of "liter atmospheres") of the heat absorbed, at the same temperature, during the melting of one gram of the substance. (By a "liter atmosphere" is meant the minimum mechanical work required to cause a diminution of

one liter in any volume against the constant resistance of a pressure of one atmosphere.) It will be observed that if V is greater than V', i.e., if the melting is accompanied by an increase in volume, the above expression is positive, and hence an increase of pressure causes the melting temperature to rise. On the contrary, if V' is greater than V, the expression is negative, and hence an increase of pressure causes the melting temperature to *fall*. These theoretical results are in perfect agreement with experimental observation. In the case of ordinary ice, melting is accompanied by a contraction in volume, i.e., V' is greater than V, and the above formula leads to the result that while under normal atmospheric pressure ice melts at 0° C. (32° F.), the melting point under a pressure of two atmospheres would be — 0.0074° C. (31.9867° F.). As far back as 1851 William Thomson (Lord Kelvin) obtained practically the same result by direct observation, and the formula has since been found to hold similarly good in the case of other substances examined.

It must be observed that the Thomson-Clausius formula correlates the *change* of melting point with the *change* of external pressure. In recent years Rosanoff discovered an equation correlating the melting point itself and the external pressure itself. According to this equation the melting point of ordinary ice, e.g., would be reduced to — 5° C. (+ 23° F.) by a pressure of 615.2 kilograms per square centimeter. Experimentally, Tammann found that ice melted at — 5° C. under a pressure of 615 kilograms.

The melting point is generally also affected by the state of subdivision of the solid—the smaller the particles, the lower the melting point. In 1909 Pavloff established a mathematical relationship between the melting point of a substance and the diameter of its particles.

Eutectic Mixtures. It was shown in the article FREEZING POINT that if a solution happens to be saturated at its freezing point, the solid gradually separating out by freezing and the liquid remaining unfrozen cannot but have the same composition, and hence the freezing temperature must remain constant. It is perfectly obvious that the solid mixture thus obtained must entirely melt at the same constant temperature. Mixtures of salts thus obtained from solutions are termed cryohydrates. More generally, and whatever its origin, a mechanical mixture that melts at a constant temperature lower than that of any other mixture of the same substances is termed a eutectic mixture. Following are a few examples of eutectic alloys: an alloy containing 55.58 per cent of bismuth and 44.42 per cent of lead melts at the constant temperature of 122.7° C. (252.86° F.); an alloy of 46.70 per cent of bismuth and 53.30 per cent of tin melts at 133° C. (271.4° F.); an alloy of 59.19 per cent of bismuth and 40.81 per cent of cadmium melts at 144° C. (291.2° F.); an alloy of 92.85 per cent of bismuth and 7.15 per cent of zinc melts at 248° C. (478.4° F.); an alloy of 47.75 per cent of bismuth, 18.39 per cent of lead, 13.31 per cent of cadmium, and 20.55 per cent of tin melts at 71° C. (159.8° F.). See FREEZING POINT; FUSIBLE METALS; PHASE RULE.

MELTON-MOWBRAY, měl′ton mō′brâ. An urban district and market town in Leicestershire, England, 14 miles northeast of Leicester, in the valley of the Eye, near its junction with the Wreak (Map: England, F 4). It has a fine early English parish church and is famous for its Stilton cheese and pork pies. It has large quarries of iron ore, smelting furnaces, and an important cattle market. It is the Midlands "metropolis of fox hunting," with numerous hunting seats, and in the winter is crowded with sportsmen. It is a very ancient town, being called in the Domesday Book *Medeltune*. In 1644 it was the scene of a defeat and slaughter of the Parliamentarians. Pop., 1901, 7454; 1911, 9202.

MELTZER, mĕlts′ĕr, SAMUEL JAMES (1851–1920). An American physiologist. Born in Russia, he was educated at Königsberg, Prussia; studied philosophy and medicine at the University of Berlin (M.D., 1882); and in the following year he emigrated to the United States, where he practiced his profession in New York City, serving as consulting physician to Harlem Hospital. In 1906 he became head of the department of physiology and pharmacology in the Rockefeller Institute for Medical Research. He served as president of the Harvey Society, of the Association for the Advancement of Clinical Research in 1909, and of the Association of American Physiologists in 1915.

MELUN, *me-lēn′*. The capital of the Department of Seine-et-Marne, France, built on an island and on both banks of the Seine, 28 miles southeast of Paris (Map: France, N., H 4). It has an eleventh-century church, a communal college, normal school, and several learned societies. The town is an important railroad centre. The manufactures are carriages, cotton and woolen goods, earthenware, chocolate, agricultural tools, furs, lumber, and cement; and there is trade in grain, flour, cattle, and poultry. Pop. (commune), 1901, 13,059; 1911, 14,861. Melun was taken five times during the ninth century by the Northmen. It fell into the hands of the English in 1419, but they were driven out by Joan of Arc in 1430.

MEL′USI′NA. A powerful water fairy, half woman and half fish, in French folklore. She became the wife of Count Raymond of Poitiers and built a castle which from her own name was called Lusinia, the present Lusignan. When her husband surprised her in her double form in the bath she disappeared. When the death of a member of the family or of the King of France was about to occur she appeared in a high tower of the castle, in mourning garments, and announced the approaching event by three shrill cries. The legend was used in 1387 by Jean d'Arras as the basis of a romance, which was rendered into French verse by Conedoette in 1401, and in translations and other forms made the character of Melusina famous. Consult: Kohler, *Der Ursprung der Melusinensage* (Leipzig, 1895); Roy, *Melusine* (1898); Leo Desaivre, "Notes sur Melusine," in *Bulletin de la Société des antiques de l'Ouest* (Poitiers, 1899); Baudot, *Les princesses Yolande et les ducs de Bar* (Paris, 1900); E. S. Hartland, "Romance of Melusine," in *Folk-lore*, vol. xxiv (London, 1913).

MEL′VILLE, or **MELVILL,** ANDREW (1545–1622). A Scottish reformer. He was born Aug. 1, 1545, at Baldovie, near Montrose, Forfarshire. In 1580 he was chosen principal of St. Mary's College, St. Andrews. In 1582 he preached the opening sermon before the General Assembly and boldly "inveighed against the bloody knife of absolute authority, whereby men intended to pull the crown off Christ's head

and to wring the sceptre out of his hand." The Assembly applauded his intrepidity, drew up a remonstrance in a similar spirit, and appointed Melville and others to present it. In 1584 Melville was summoned before the Privy Council. He maintained that whatever a preacher might say in the pulpit, even if it should be called treason, he was not bound to answer for in a civil court, until he had been first tried in a church court. For this denial of secular jurisdiction he was condemned to imprisonment, but escaped to London, where he remained till the downfall of Arran in the following year. After an absence of 20 months he returned to Scotland and resumed his office at St. Andrews. In 1606 Melville was called to England to attend the famous conference at Hampton Court. Having ridiculed the service in the Chapel Royal in a Latin epigram, he was twice summoned before the English Privy Council, and on the second occasion his temper gave way and he broke out into a torrent of invective against the Archbishop of Canterbury for encouraging popery and superstition, profaning the Sabbath, etc. The King immediately sent him to the Tower, where he remained for more than four years. In 1611 he was released on the solicitation of the Duke of Bouillon, who wanted his services as a professor in his university at Sedan in France, where he spent most of his remaining years. Melville died at Sedan, in 1622, but neither the exact date of his death nor the events of his last years are ascertained. He published much in prose and verse, in Latin and English. Consult his *Life* by McCrie (2 vols., London, 1819; rev. ed., 1856), and W. L. Mathieson, *Politics and Religion: A Study in Scottish History, 1550–1695* (2 vols., New York, 1902).

MELVILLE, George John Whyte (1821–78). An English author. He was born near St. Andrews, Scotland, and entered the army in 1839. In 1846 he became captain in the Coldstream Guards and during the Crimean War served as a volunteer in the Turkish cavalry. Melville may be justly regarded as the founder of the fashionable novel of the high-life sporting variety. In describing the hunting field he aroused much interest, as shown by the popularity of his score or more of novels from *Kate Coventry* in 1856 to *Black but Comely* in 1878.

MELVILLE, George Wallace (1841–1912). A distinguished American naval officer, engineer, scientist, and polar explorer, born in New York City, Jan. 10, 1841. He was educated in New York and at the Brooklyn Polytechnic Institute, and entered the navy as a third assistant engineer in 1861. He served on the *Dakotah* in the action at Lambert's Point, in the capture of Norfolk, and in the attacks on Drewry's Bluff. Later, he was attached to the *Wachusett* and was commended for his conduct in connection with the capture of the Confederate cruiser *Florida*. In 1873 he volunteered as engineer of the *Tigress* and served on her in the search for the survivors of the *Polaris*. Six years later he volunteered as engineer of the ill-fated *Jeannette*. He commanded one of the three boats after the *Jeanette* sank, and, after a terrible journey of 100 days and 2200 miles, he reached the Lena Delta, the party under his command being the only one that survived. After his arrival he set out on a long search for the other officers and men, but after 23 days illness and bad weather compelled him to return. Setting out again in the spring, he found the camp and the bodies of his comrades. For his conduct on this expedition he was highly commended by the Navy Department, was given a gold medal by Congress, and by special act promoted to the grade of chief engineer. He again volunteered for the Greely relief expedition and was one of the first to reach the survivors at Cape Sabine. From 1887 to his retirement in 1903 he was engineer in chief of the navy. His services as chief of the Bureau of Steam Engineering for this long period were of the greatest importance, covering nearly all the engineering work in the building of the new navy. He was a strong advocate of high speed in warships, vertical engines instead of horizontal, and was the first to use triple screws in large ships (*Columbia* and *Minneapolis*). He established the engineering experimental station and postgraduate school, and from his long series of experiments with coal and liquid fuel much was learned. He was an early advocate of water-tube boilers, putting them on board the *Monterey* in 1889, but opposed their general use until suitable types were developed; in the successful development of these he was largely concerned. He received many marks of distinction at home and abroad, including decorations, honorary degrees, and the presidency of the American Society of Mechanical Engineers (1899). By the naval personnel act of 1899 he became a rear admiral, and with that rank he retired in 1903. He died March 17, 1912.

MELVILLE, Herman (1819–91). An American novelist, born in New York City and noteworthy for his stories of the sea. He was educated at the Albany Classical School and in New York City, and went to sea in 1837 in a merchant vessel bound for Liverpool. In 1841 he rounded Cape Horn on a whaling cruise, and was so ill treated that in the next year he and a companion made their escape from the ship and were taken captives by the Typees, a warlike tribe of Nukahiva, one of the Marquesas Islands. His companion soon escaped and Melville was finally rescued after four months by the crew of an Australian whaler. He spent the next two years (1842–44) in and about the Pacific Islands, and on his return to New York told the story of his experiences at sea and his romantic captivity in *Typee: A Peep at Polynesian Life during a Four Months' Residence in a Valley of the Marquesas* (1846), which enjoyed a sensational and not undeserved success. In 1847 Melville married the daughter of Chief Justice Lemuel Shaw of Massachusetts. In 1850 he moved with his family to Pittsfield, Mass., but returned in 1863 to New York. There he occupied a place in the customhouse continuously from 1866 till 1885, when because of failing health he resigned. The period of his popularity, embraced in the years 1846–52, was one of rapid production of such stories as *Omoo* (1847); *Mardi* (1848); *Redburn: His First Voyage* (1848); *White Jacket, or the World in a Man of War* (1850), in which the horrors of flogging in the navy were so graphically set forth that the abolition of the practice soon followed; *Moby Dick, or the White Whale* (1851); and *Pierre, or the Ambiguities* (1852). After 1852 he published three other volumes of fiction, *Israel Potter: His Fifty Years of Exile* (1855); *Piazza Tales* (1856); *The Confidence Man* (1857); and later several books of poems,

lyric and epic, such as *Battle Pieces and Aspects of the War* (1866); *Clarel: A Pilgrimage in the Holy Land* (1876); *John Marr and Other Sailors* (1888); *Timoleon* (1891). His *Typee, Omoo, Moby Dick,* and *White Jacket* were reëdited in 1892 with an introduction by Arthur Stedman.

MELVILLE, Sir James (1535–1617). A Scottish soldier and diplomat. He served under the Constable Montmorenci in Flanders in 1553 and in 1557 was taken prisoner at the battle of St. Quentin. Two years after he obtained his release and was dispatched to Scotland on a secret mission. During his absence occurred the tournament in which Montmorenci killed Henry II; and at Melville's return he judged it best to turn his steps towards Germany, where he was employed by the Elector Palatine. While on a visit to France in 1561 he met Queen Mary of Scotland, to whom he tendered his allegiance and sword. In 1564 he returned to his native land and presented himself to Mary at Perth. Shortly afterward he was sent to England as ambassador to Queen Elizabeth. Again in 1566 he was sent to England to bear the news of the birth of an heir to the Scottish throne. He adhered to the Queen so long as there appeared to be any hope of her ultimate success, but after she was committed to Lochleven Castle, was sent by the nobles to offer the regency to the Earl of Murray. During Morton's regency he retired from court, but when James began to reign was received with favor. He was knighted and appointed Privy Councilor and gentleman of the bedchamber to Queen Anne. On James's accession to the English throne, Melville retired into private life and died at Hallhill, Nov. 13, 1617. *The Memoirs of Sir James Melvil of Hallhill; Containing an Impartial Account of the most Remarkable Affairs of State during the Last Age, etc.,* accidentally discovered in Edinburgh Castle in 1660, were published in 1683 by his grandson, George Scott, but in an incomplete form. An accurate edition was printed in 1827–33 at Edinburgh, by the Bannatyne Club, and is of great historic value. Consult J. H. Burton, *The History of Scotland* (Edinburgh, 1867–70).

MELVILLE, James (1556–1614). A Scottish reformer, nephew of Andrew Melville. He was born at Mayton, near Montrose, and graduated B.A. at St. Andrews in 1571. He was professor at Glasgow (1575–80) and at St. Andrews (1580–84), but in 1584 was compelled by Bishop Adamson to follow his uncle in flight to Berwick. In the following year he returned to Scotland, renewing his quarrels with the Bishop. In 1586 he was ordained to the Presbyterian ministry. James VI made him vicar of Abercrombie and in 1589 Melville was chosen moderator of the General Assembly. After James became King of England he detained Melville at Newcastle-on-Tyne because of his refusal to support episcopacy, although high honors were promised him if he would take the King's side. His published works include prose and poetry, but his diary (1556–1610), printed by the Woodrow Society (Edinburgh, 1842), is especially valuable as a source for the ecclesiastical history of the time.

MELVILLE, Lewis. The pen name of Lewis S. Benjamin (q.v.).

MELVILLE, Viscount. A British statesman. See Dundas, Henry.

MELVILLE ISLAND. One of the Parry Islands of Arctic North America, situated in lat. 74° to 77° N., north of Melville Sound and between Bathurst and Prince Patrick Islands, the latter being the westernmost island of the group (Map: America, North, G 2). Melville Island is very irregular in outline, 200 miles long and about 100 miles broad; it is of carboniferous lime and sandstone formation, and contains coal beds. It was discovered by Parry, who wintered there (1819–20). Although several times skirted by sledge parties (1853–55) during the Franklin relief search, it has been visited by only one other ship, the *Arctic,* under Bernier in the Canadian expedition (1908–09). He wintered there and examined fully the resources of Melville and other adjacent islands.

MELVILLE PENINSULA. A projection of the north shore of North America, extending north of Hudson Bay, and belonging to the Canadian Territory of Keewatin (Map: America, North, K 3). It is connected with the mainland by Rae Isthmus, and bounded on the west by Committee Bay, discoveries which were made by Dr. John Rae in 1846. It is separated from Cockburn Island on the north by Fury and Hecla Strait, from Baffin Land on the east by Fox Channel, and from Southampton Island on the south by Frozen Strait.

MELVILLE SOUND. One of the numerous passages between the islands of Arctic North America (Map: America, North, H 2). It lies between Melville Island on the north and Prince Albert Land on the south, and extends from Prince of Wales Island in the east, where it communicates through Barrow Strait and Lancaster Sound with Baffin Bay, to Banks Land in the west, where Banks Strait opens into the Arctic Ocean. Its length is 225 miles and its width is from 50 to about 175 miles. Its southern extent was largely unknown until Hansen, of Amundsen's expedition, extended the coast of Victoria Land northwest to Cape Nansen, calling the new regions King Haakon VII Land (1903–04). From Cape Nansen to Glenelg Bay the exact outlines are yet unknown.

MEM'BERED (from *member,* OF., Fr. *membre,* from Lat. *membrum,* limb). A term in heraldry applied to a bird having its beak and legs of a different color from its body; it is then said to be membered of that color.

MEMBRA'NA PU'PILLA'RIS (Lat., pupillary membrane). The name given to a very thin membrane which closes or covers the central aperture of the iris in the fœtus during an early period of gestation; it begins to disappear in the seventh month.

MEM'BRANE (Lat. *membrana,* from *membrum,* limb), in Anatomy. The term applied to those textures of the animal body which are arranged in the form of laminæ and cover organs, or line the interior of cavities, or take part in the formation of the walls of canals or tubes. The structure and special uses of some of the most important of the animal membranes are noticed in separate articles, such as Mucous Membrane, Serous Membrane, etc.; and the membranes in which the fœtus is inclosed—commonly called the fœtal membranes—are described in the article Placenta. Bowman's membrane and Descemet's membrane are special structures, being respectively the second and fourth layers of the cornea. (See Eye.) The membranes which cover and protect the brain and spinal cord are commonly termed *meninges,* from the

Greek word *meninx*, a membrane. Simple membranes are of three kinds—mucous, serous, and fibrous. Mucous membranes line the cavities which communicate externally with the skin, as the mouth, intestinal canal, genito-urinary passages, internal surface of the eyelids, and the ramifications of the respiratory passages, the Eustachian tubes, and middle ear. Mucous membrane has three layers: a fibrovascular layer, composed of blood vessels, nerves, and connective tissue, which is continuous with the tissue beneath and interlacing with it; a more superficial layer, called basement membrane, which is described as structureless, and upon which rests the superficial layer, or epithelium, the latter presenting a variety of structure in different parts of the body. This membrane is at times elevated into papillæ or villi, or else depressed in the form of glands. The mucous membranes secrete mucus to lubricate the various passages, and also other fluids for special physiological purposes. The saliva, the gastric and pancreatic juices which aid digestion, are examples of special secretions. The serous membranes are of two kinds: those lining visceral cavities, such as the pericardium, pleuræ, and peritoneum; and those lining joint cavities (synovial membranes). A third species of simple membrane is the fibrous, divided into two kinds—enveloping aponeuroses, the fibrous capsules of joints and the sheaths of tendons; and the enveloping membrane of bone, the periosteum, the dura mater (the internal periosteum of the skull), the fibrous membrane of the spleen and of other glandular organs. See SPLEEN.

MEMBRÉ, mäN′brā′, ZENOBIUS (1645–87). An early missionary to Canada, born at Bapaume, France. He became a Recollect of the Franciscan Order and went as a missionary to Canada in 1675; accompanied La Salle upon his expedition to the Mississippi in 1679, stopping at Fort Crèvecœur, on Lake Peoria, where, with Father Gabriel de la Ribourde, he conducted a mission among the Illinois until driven by the Iroquois to the Jesuit settlement at Green Bay. He descended the Mississippi with La Salle in 1682 and returned the same year to France, where he published an account of the expedition. After acting for a time as warden of a convent at Bapaume he came again to America with La Salle in his final expedition by sea to Texas in 1684, and remained in Fort St. Louis, where, with his companions, he was massacred by the Indians. Consult J. D. G. Shea, *Discovery and Exploration of the Mississippi Valley* (2d ed., Albany, 1903).

MEMEL, mā′mel. A river emptying into the Baltic. See NIEMEN.

MEMEL. A seaport town of Prussia, in the Province of East Prussia, the most northern town of Germany, situated near the Russian border at the entrance of the Dange into the north end of the Kurisches Haff, 58 miles by rail north-northwest of Tilsit (Map: Germany, J 1). It has an excellent harbor protected by two lighthouses and a fort, and is of great importance in the Baltic lumber trade. The logs, sawed in the local mills, are brought down from the forests of Russia by the König Wilhelm Canal and by the Niemen, here known as the Memel. Memel manufactures machinery, soap, amber, celluloid, cigarettes, vinegar, and rope, and has trade in agricultural products imported from Lithuania, coal, petroleum, herrings, and local manufactures. It has several dry docks. The educational institutions include a Gymnasium, a seminary for teachers, and a school of navigation. Memel was founded in 1252 by the Teutonic Order. It joined the Hanseatic League in 1254 and soon rose to a position of considerable commercial importance. It was held by the Swedes for some time during the seventeenth century, was taken by the Russians in 1757, and was the residence of Frederick William III after the battle of Jena in 1807. Here also, in 1807, a treaty of peace was concluded between England and Prussia. It was again seized by Russia in 1812. Memel was occupied for the third time by the Russians in the European War which broke out in 1914. They were forced to retire when the Germans brought up superior forces. See WAR IN EUROPE. Pop., 1910, 21,470, chiefly Protestants.

MEMLING, mĕm′lĭng, or **MEMLINC**, HANS (c.1430–94). One of the most eminent painters of the early Netherlands school. According to the best available evidence he was born at Mömlingen, near Aschaffenburg, Bavaria, and appears permanently settled in Bruges in 1478, although he was probably active there some years earlier. On the evidence of two documents, which do not, however, prove the supposition, he is said to have been the pupil of Rogier van der Weyden. But his work bears little resemblance to that master's. His earlier paintings, in particular a triptych (c.1468) belonging to the Duke of Devonshire at Chatsworth, and "St. John the Baptist" and "St. Lawrence" in the National Gallery, London, show rather the influence of Dierick Bouts. As his name never appears in the painters' guild at Bruges, he is thought to have been employed in the service of Charles the Bold, Duke of Burgundy, which would have exempted him from registering. He attained a reputation far beyond Bruges, his pictures being bought by the Medici in Florence and by Cardinals Grimani and Bembo in Venice, as well as in England, France, and Spain. That he enjoyed material prosperity is evident from his subscription to the war loan of Emperor Maximilian and from the terms of his testament.

Memling's works, of which a large number survive, may be best studied at Bruges, especially in the Hospital of St. John. One of the most important there is a magnificent though somewhat damaged altarpiece representing in the centre the "Marriage of St. Catharine," with the two St. Johns and St. Barbara, and, on the wings, the "Death of John the Baptist" and "St. John's Vision at Patmos." To the same year (1479) belongs the triptych known as the Floreins altarpiece, representing the "Adoration of the Magi" and the "Presentation in the Temple." Other important works in the Hospital of St. John are a diptych (1487) with the Madonna, and on the other wing the donor, Martin van Nieuwenhoven, one of the best of Memling's portraits, and the "Shrine of St. Ursula" (1489), a reliquary in the shape of a Gothic chapel. Its 14 scenes are remarkable for the freedom and grace with which he has treated groups and figures of small proportions, but some are probably the work of pupils. A triptych (1484) with "St. Christopher and the Infant Christ" in the centre, in the Museum at Bruges, also ranks high among his works. The Museum at Brussels possesses a fine "Crucifixion" and that of Antwerp a large and magnificent triptych, once in the church of Najara. The latter, executed in collaboration with pupils, represents "Christ

as the King of Heaven," surrounded by 12 beautiful angels making music on the different instruments used in that day. Other celebrated pictures by Memling are: a triptych containing more than 200 figures, the centre occupied by the Crucifixion (1491), in the cathedral at Lübeck, in which he was aided by his pupils; the "Seven Joys of the Virgin" (1480), in the Pinakothek, Munich; the "Seven Sorrows of the Virgin," in the Gallery of Turin; the Madonnas in the Uffizi, Florence, the Louvre, the Berlin Museum, and the National Gallery, London; a large altarpiece with the "Last Judgment" (1470–77), in the church of St. Mary at Danzig, one of the best of his early works. The Metropolitan Museum of New York possesses in the Altman collection a smaller and more intimate version of the "Betrothal of St. Catharine," besides a fine portrait of an unknown old man and portraits of Tommaso Portinari and his wife. Other fine examples of his portraits are those of the Burgomaster Moreel, his wife and daughter (the so-called "Sibylla Zambetha"), in the Brussels Museum; the "Old Canon," at Antwerp; and other examples at Frankfort and Florence. Memling was, along with Gerard David, the most important master of the Flemish school during the late fifteenth century.

Bibliography. Michiels, *Memling, sa vie et ses ouvrages* (Verviers, 1883); Wauters, *Sept études pour servir a l'histoire de Hans Memling* (Brussels, 1894). Good brief works are: Kaemmerer, *Memling* (Bielefeld, 1899); Bock, *Memling-Studien* (Düsseldorf, 1900); Gaederiz, *Der Altarschrein von Hans Memling in Dom zu Lübeck* (Leipzig, 1901); *Masters in Art*, vol. vi (Boston, 1905), containing an exhaustive bibliography; Voll, *Altniederländische Malerei* (Leipzig, 1906); Fierens-Gevaert, *Les primitifs flamands* (Brussels, 1909); Weale, *J. C. Memlinc* (New York, 1909).

MEMMI, mĕm′mē, SIMONE. See MARTINI, SIMONE.

MEMMINGEN, mĕm′ĭng-en. An ancient town of the Kingdom of Bavaria, Germany, situated on the river Ach, a tributary of the Iller, 33 miles south-southeast of Ulm (Map: Germany, D 5). It is still partly surrounded with walls, and its church of St. Martin has fine late Gothic choir stalls dating from the fifteenth century. The Roman Catholic church with its fine altarpieces, the sixteenth-century Renaissance Rathaus, and the Fuggerbau, in which Wallenstein received his dismissal from the command of the army in 1630, are also noteworthy. The educational institutions of the town include a Realschule, a seminary for teachers, a theatre, a museum, and a library, with an important collection of archives. Memmingen manufactures woolens and linen, cordage, machinery, fertilizer, fire extinguishers, iron goods, leather, soap, and there are foundries for large bells and structural steel. There is a good trade in agricultural products, hops, cheese, wool, and live stock. The town is first mentioned in 1010 and became a free city of the Empire in 1286. It was a member of the Schmalkalden League; it became Bavarian in 1802. Pop., 1910, 12,362.

MEMMINGER, mĕm′ĭn-jēr, CHRISTOPHER GUSTAVUS (1803–88). An American political leader, Secretary of the Treasury in the government of the Confederate States. He was born in Württemberg, Germany, but was brought at an early age to South Carolina by his mother, who died not long after their arrival. He was for a time in an orphan asylum in Charleston, and was then adopted by Governor Thomas Bennett. Memminger graduated from South Carolina College in 1820, studied law, and practiced in Charleston. He was an opponent of Calhoun and in 1832 wrote the *Book of Nullification*, a satire in biblical style upon that leader's favorite doctrine. He was for many years a member of the State Legislature, and for nearly 20 years was the head of the finance committee. He was one of the first to plan for the organization of a system of public schools in South Carolina. In January, 1860, he was sent as a special commissioner to Virginia in order to induce that State to participate in a scheme for obtaining redress of Southern grievances. Some months later he was one of the leaders in the convention which declared that the connection of South Carolina with the United States was dissolved. Upon the formation of the Confederacy he was made Secretary of the Treasury, which office he held until June, 1864, when he resigned. He failed to display sufficient capacity to cope with the difficulties that beset the financial policy of the Confederate government. For an account of his administration, consult J. C. Schwab, *The Confederate States of America, 1861–65: A Financial and Industrial History of the South during the Civil War* (New York, 1901).

MEM′NON (Lat., from Gk. Μέμνων). In Greek legend, a son of Tithonus and Eos (the dawn), King of the Ethiopians, who led an army to aid his uncle, Priam, King of Troy, after the death of Hector. Clad in armor made by Hephæstus (or Vulcan), he made great slaughter among the Greeks, and finally killed Antilochus, who was defending his father, Nestor. Over the body of Antilochus he met Achilles and fell before him. His mother by her tears obtained from Zeus his immortality, and his body or, in another story, his ashes were carried to his native country. The river Paphlagonius was said to flow blood yearly on the anniversary of his death. His comrades were changed to birds, and it was said they returned yearly from the south and fought around the funeral mound erected for their leader at Troy. In the earlier writers Memnon leads his forces from the extreme East, or Assyria; later his native land was sought in Syria, and not earlier than the end of the fifth century B.C. was it localized in Egypt and Æthiopia. Memnonia (see MEMNONIUM) were said to exist at Susa in Persia and at Abydos and Thebes in Egypt. Indeed, in Ptolemaic times the west bank of the Nile at Thebes was the Memnonium, as the east was Diospolis. Near by are two colossal statues of King Amenophis III (q.v.) of the eighteenth dynasty, the southern one of which was said to give forth a sound when struck by the rays of the rising sun, a sound probably due to the sudden expansion of the sandstone conglomerate from which the statue is hewn, and the consequent passage of air through the pores of the stone. Consult J. B. Mayor's note on *Juvenal*, 15, 5, in his edition of *Juvenal* (London, 1888). Strabo (c.20 B.C.) does not mention the name of Memnon in describing this phenomenon, but early in the first century of our era the story gained currency that the statue represented Memnon, who thus greeted his mother in the morning. From the time of the Flavian emperors to that of Septimius Severus the world seems to have been fond of visiting this place, and the sides of the figure are covered with names and verses re-

ferring to the legend. Among the visitors were Hadrian and his wife, Sabina, in 130 A.D. At some time before Strabo's visit the upper part of the statue had been overthrown by an earthquake (popular tradition said by Cambyses); when the statue was rebuilt by Severus the sounds ceased.

Memnon has been regarded by many scholars as properly a solar deity. In art the combat of Memnon and Achilles in presence of Eos and Thetis, and the removal of the body of Memnon by his mother or by sleep and death, were favorite subjects with the Attic vase painters. Memnon figured largely also in the writings of the cyclic poets (q.v.), especially in the *Æthiopis* of Arctinus: for this poem consult Monro's edition of the *Odyssey*, books xiii–xxiv (Oxford, 1901). The chief ancient source, however, is the *Posthomerica* of Quintus Smyrnæus. Consult: Friedrich Jacobs, *Ueber die Gräber des Memnon* (Munich, 1830); Thirlwall, in *Philological Museum* (Cambridge, 1832); J. A. Letronne, "La statue vocale de Memnon," in *Mémoires de l'Institut Royal de France* (Paris, 1833); Curzon, in *Edinburgh Review* (Edinburgh, 1886); the article "Memnon" in W. H. Roscher, *Lexikon der griechischen und römischen Mythologie*, vol. ii (Leipzig, 1890–97).

MEMNO'NIUM (Lat., from Gk. Μεμνόνιον). The name applied in Ptolemaic times to an Egyptian temple about 8½ miles from the Nile, near Abydos. The geographer Strabo (c.30 B.C) mentions it with admiration and compares it with the celebrated Labyrinth (q.v.). In 1859 Mariette, with the financial aid of the Egyptian government, cleared away the sand and rubbish which covered the building and made it accessible to visitors and students. The temple, begun by Seti I, and completed by his son, Ramses II, was dedicated to the gods of Abydos and to the manes of Seti and of his predecessors on the throne of Egypt. Among the numerous reliefs that adorn its walls are some of the finest specimens of Egyptian sculpture. The most important are in a long gallery known as the Gallery of Kings. On the right wall of this room are depicted King Seti I and his son Ramses adoring their royal ancestors whose cartouches are inscribed in two long lines. The list contains the names of 76 kings of Egypt, beginning with Menes (q.v.) and ending with Seti I (q.v.), but it is far from complete. It does not contain the names of monarchs regarded as illegitimate or unimportant, and it omits all the rulers from the thirteenth to the seventeenth dynasty. Copies of the list are to be found in Meyer, *Geschichte des alten Aegyptens* (Berlin, 1887), and in W. M. F. Petrie, *A History of Egypt* (New York, 1897). Similar lists exist at Karnak and at Sakkarah (q.v.). Consult: A. E. Mariette, *Abydos* (Paris, 1869–80); id., *The Monuments of Upper Egypt* (London, 1877; rev. by L. Dickerman, Boston, 1890); Baedeker, *Egypt and the Sûdân* (7th ed., Leipzig, 1914).

MEM'ORABIL'IA (Lat., memorable things). Something worthy of being remembered or noted down, especially the Latin title of *Memoirs of Socrates*, by Xenophon (q.v.).

MEMO'RIAL ARCH. See ARCH, TRIUMPHAL, or MEMORIAL.

MEMORIAL ARCHITECTURE. In all ages men have sought to preserve the memory of their own transitory lives and deeds by the erection of cairns, mounds, pillars, tombs, and other structures capable of defying the destroying power of time. (Consult Gen. xxviii. 18; Josh. iv. 3–9; see also MEGALITHIC MONUMENTS; OBELISK; PYRAMID.) With the progress of art such monuments took on forms of greater elegance and complexity. The Assyrians set up inscribed stelæ; that of Shalmaneser, a square shaft of black basalt inscribed on all four faces, is in the British Museum. The commemorative stelæ and sculptured gravestones of the Greeks were of moderate size but of great beauty of form and execution. The Roman pride of conquest and love of grandeur led to the development of two forms of memorial which have continued to be used or imitated down to modern times—the arch and the column. The Roman triumphal arches were erected to commemorate victories; of these, three of the most famous are in Rome, those of Titus, of Septimius Severus, and of Constantine; other celebrated examples are at Ancona and Benevento in Italy, Rheims and Orange in France, Baalbek in Syria, in Africa, Spain, etc. (See ARCH, TRIUMPHAL.) Memorial columns were erected for a like purpose, usually of the Doric or Corinthian order, and of imposing size, sometimes in reality towers in the form of columns, as the columns of Trajan and of Marcus Aurelius at Rome, covered with reliefs in ascending spirals depicting their campaigns. (See COLUMN; ANTONINE COLUMN; TRAJAN'S COLUMN.) Both these kinds of memorial have been often imitated in modern times. Among modern arches are those erected by or in honor of Napoleon in Paris—Arch of the Carrousel, Arc de l'Etoile; the Arch of Peace at Milan, the Washington Arch (New York) and Soldiers' and Sailors' Memorial Arch in Brooklyn (N. Y.); and the Brandenburger Thor, Berlin—not an arch, properly speaking, but a triumphal gateway. Among modern columns two of the most beautiful and famous are in Paris—the Colonne Vendôme in the square of that name (see VENDÔME) and the Colonne de Juillet on the site of the Bastille. (See COLUMN, Plate, Fig. 17.) In memory of the victory of Commodore Perry on Lake Erie a lofty Doric column was being erected in 1915.

Modern memorial structures other than obelisks, statues or groups (see SCULPTURE), tombs, arches, and columns are of very varied kinds. Churches, hospitals, chapels, homes, and libraries are often built as memorials, e.g., the Crimean Memorial Church at Constantinople, the Rylands Memorial Library at Manchester (England), Memorial Hall of Harvard University, etc. The Ruhmeshalle at Munich and the Hall of Fame of New York University are galleries to commemorate the great men of Bavaria and of the United States respectively. The Soldiers' and Sailors' Memorial at New York is a lofty temple-like circular edifice. The Lincoln Memorial now (1915) under erection at Washington, D. C., is a severe and stately Doric hall. The Champlain Memorial at Crown Point, N. Y., is in the form of a government lighthouse. Memorial halls often take the form of historic museums containing documents and objects of historic interest associated with the person or event commemorated. The mere enumeration of the varieties of memorial buildings, monuments, parks, and decorations would require several pages. Next to religion, commemoration offers the highest inspiration and the widest opportunity to artistic creativeness, both for the architect and the sculptor; for except in the case of purely sculptural monuments and of utilitarian build-

ings erected as memorials, both these arts must be associated in order to secure the highest results. See MAUSOLEUM; MONUMENT; TOMB.

MEMORIAL CROSS. See CROSS.

MEMORIAL DAY. See DECORATION DAY.

MEM'ORY (OF. *memorie, memore, memoire,* Fr. *mémoire,* from Lat. *memoria,* from *memor,* mindful; connected with Gk. *μέρμερος, mermeros,* anxious, Skt. *smar,* to remember). The conscious representation of past experience. To say that a man has a good memory means that he is able to recall past events fully and accurately. The term is also used, more broadly and loosely, to include the capacity of retention. Thus memory is figuratively called a storehouse. This implies that within memory are preserved bits of experience which may reappear in consciousness from time to time in the form of recollections. It is well to keep distinct the terms "retention," which properly considered is a physiological fact, a matter of cerebral mechanics, and "conscious representation," or "recollection"—memory in the strictly psychological sense.

Recollection involves no new or peculiar mental processes. The core of a recollection or a memory, as it may be called, is the memory idea. This may appear either as an image—visual, auditory, tactual, etc. (see IMAGINATION; IMAGE)—or as a word or a series of words. The thing that brands the image or word as a memory idea is, first of all, a feeling of familiarity (see FAMILIARITY). Memory is thus intimately related to recognition, which is likewise characterized by the feeling of familiarity; but it differs from recognition in that the latter has as its content a present perception instead of an idea. In imagination, on the other hand, we find as a characteristic mark the feeling of strangeness or unfamiliarity. Furthermore, a recollection is ordinarily specific; the idea comes not only as familiar but also as specifically placed and dated. These references of place and time are meanings which are themselves represented in consciousness by organic sensations and other associated ideas, and which thus form a further mark of distinction between memory on the one hand and recognition and imagination on the other. It is always necessary to distinguish between the memory idea, as mental process, and the meaning carried by that idea; e.g., the memory idea of the capitol at Washington may be only a vague visual image of the dome, but this image stands for, means, the entire building. (See MEANING.) The failure to draw this distinction has led to misunderstanding of the true nature of memory imagery. Another point to notice is that, with lapse of time, the memory idea is subject to change of various kinds: it tends to fade out completely or to be replaced by typical and habitual images, or, again, to be replaced in part by foreign imaginal contents; so that after an interval, say, of some months or years a memory idea shows in numerous details a lack of correspondence with the original perception. The fading of the memory idea and its filling out with imaginal contents are due, first, to the decay of the impression made on the nervous system, and secondly to a general determining tendency to make a full and complete picture out of a fragmentary one; the same tendency is seen in the reconstruction of dreams after waking, and again in the invention of details to round out a good story. The true memory idea, indeed, is found experimentally to be far less complete, more filmy, of poorer coloring, and less stable, than it is commonly thought to be.

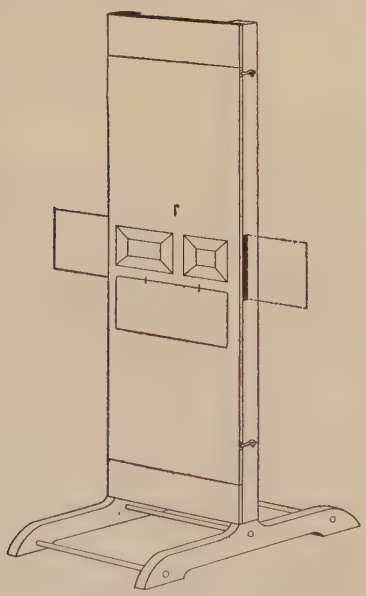
There are, in strictness, numerous partial "memories"—auditory, visual, kinæsthetic, etc.—and not one single "memory." Auditory imagery usually occurs in combination with throat kinæsthesis; gustatory and olfactory memories are rare. Since individuals are found to differ as regards the predominant forms of imagery, it has become customary to distinguish memory types and to assign observers accordingly to a visual type, an auditory-kinæsthetic type, a kinæsthetic type, or, if the various forms of imagery appear to be more or less evenly balanced, to a mixed type. These type differences are, however, gross differences; subclasses within type may be distinguished. For example, individuals who are predominantly visual may still differ as regards the prevalence of the spatial and the qualitative attributes: one visualizes forms clearly with poor coloring; another visualizes color with marked fidelity, but outlines with vagueness; and in the same way persons who belong to the auditory type may differ in ability to image pitch, timbre, etc. Furthermore, there are individuals who tend to reduce as many ideas as possible to spatial terms: differences in pitch are visualized in steps, or felt kinæsthetically as up or down; loud tones are near, soft tones are far; short intervals of time are represented as lines of different lengths. It seems, therefore, that we must eventually distinguish "attributive types." But, finally, this whole doctrine of types must not be taken too rigorously. Nervous predisposition, the mode of presentation of the original material, the purpose or intention with which the material is recalled, are all concerned in determining the nature of the imagery that occurs at any one moment; so that the same individual may learn with one form of imagery and recall with another; and a person whose word imagery is auditory-kinæsthetic may recall objects in visual imagery.

Recollection is either active or passive. The effort to "call up" a name or a situation in which a known event occurred is an instance of active recollection; whereas, in passive recollection, memories "come of themselves," as in the case of a reverie or in the successive appearance of the words and music of a remembered song. The former demands active attention, the latter passive. Almost any phase of consciousness may initiate recollection; the perception of a color may do it, or that of a sound, or a shiver of cold, a feeling, a bracing effort, etc. See ASSOCIATION OF IDEAS for the incentives to recollection.

Retention rests upon some modification of the cortex during excitation. The most acceptable theory of retention is the theory of "functional dispositions" (Wundt). Excitation so disposes nerve elements that their functions are more or less permanently altered. In this manner a reëxcitation renews a function which has already been impressed upon the nervous substance. The concept of physical memory has been extended to cover all changes in organic matter which outlast the operation of their causes. It is thus made synonymous with physiological habit. See HABIT; DISPOSITION.

Experiment has attacked most of the major problems of memory. Three general methods have been used: (1) reproduction: the observer reproduces, e.g., a line of poetry or a tone that he has heard previously; (2) recognition: e.g.,

a color is shown twice in succession, and the observer reports whether he recognizes it the second time as the same color or whether it looks lighter or greener or paler; (3) comparison: emphasis is laid on the memory image, which is compared with a similar perception. The first important work was done by H. Ebbinghaus in 1885 under the first method. Series of meaningless syllables (e.g., bul, rom, cil) were read over and over, and then an attempt was made to write them from memory. The investigator found that as the interval between learning and reproducing was gradually lengthened, the amount remembered fell off at first rapidly and then more and more slowly. The influence of length of series, order, repetition, rhythm, etc., was also studied. Ebbinghaus' method, which is known as the method of complete mastery, has been repeated with many modifications and improvements in technique. The most important investigator of memory, after Ebbinghaus, is G. E. Müller, who has devised two other methods: the method of retained members, in which the learner is required, after an interval, to reproduce as many syllables as possible without regard to order; and the method of right associates, in which the observer is first required to repeat the syllables in trochaic rhythm (a procedure which breaks up the series into groups of two syllables each) and is then shown the first syllable of a group, with the instruction to respond with the first syllable that comes to mind. The nature of the response and the time elapsing between presentation of stimulus syllable and response are both important for the scoring of the results. Many forms of apparatus have been devised for the



JASTROW'S MEMORY APPARATUS.
From Titchener, *Experimental Psychology*.
(Series of colors or letters are exposed, to be memorized by the observer.)

presentation of the material to be learned; the Jastrow memory apparatus shown in the cut is one of the older and simpler forms. Other subjects related to memory which have been investigated are the character of the stimulus, combination of sense modalities, association and arrangement, the effects of disease, of age, race, and individual differences. The results of the experimental investigations of memory are treated in the articles ASSOCIATION OF IDEAS and LEARNING (qq.v.).

The systematic attempt to improve the efficiency of memory is known as the art of mnemonics, which is said to have originated with the Greek poet Simonides. Most mnemonic devices include the formation of artificial associations as an aid to recollection. A common device for remembering dates, e.g., is the association of the digits with letters. Then the letters corresponding to the figures in a date are brought together in a word which is associated, in turn, with the event whose date is to be retained.

Memory is subject to many disturbances or diseases, most of which fall under the head of amnesia, or loss of memory. Amnesia may be either general or partial. In general amnesia a greater part of memory disappears, (1) temporarily, as in epilepsy, or (2) periodically, as in altered personality, or (3) progressively (e.g., proper names are forgotten before adjectives and verbs). Partial amnesia covers loss of memory for colors, sounds, numbers, proper names, etc. (See APHASIA.) A less frequent disorder of memory is hypermnesia, or exaltation of memory. A person's general memory, or his memory for a language or for some event of his childhood, is remarkably clarified. Finally come illusions of memory, or paramnesias, in which the subject believes that a new experience has been passed through before (illusion of familiarity), or assigns to a recent date experiences which have occurred at a remote time.

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MEMORY IN ANIMALS. The more precise definition of memory as a conscious representation of past experience means that memory is characterized by the free memory idea. The existence in animals of the free idea is, however, doubtful; the evidence which is usually accepted by the layman is by no means unequivocal. In the absence of his master the dog may show signs of grief, but there is no reason to assume that symptoms of grief imply an idea of the master. The unhappiness may be consciously represented without ideation of its cause. Nor does the dog's later recognition of his master imply that he has had his master in mind, any more than recognition in man implies that the

object recognized has been thought about in its absence. (See RECOGNITION.) The movements that animals make in their sleep, or the sounds that they may then utter, have been taken as evidence of dream imagery; but there is no assurance that such behavior is not entirely reflex, or associated merely with some vague perception.

Several criteria of the free idea have been suggested. For example, very rapid learning has been held to indicate the presence of free ideas. Animals, however, seem never to learn so rapidly that the assumption of a purely representational consciousness is safe. (See LEARNING IN ANIMALS.) Inferential imitation, another proposed criterion, is seldom if ever found in animal activity; usually, when the animal imitates, the fact is that certain movements are aroused by interest in an object and not by a free purposive idea. (See IMITATION IN ANIMALS.) Still another index of memory might lie in the animal's ability to respond to a stimulus some considerable time after that stimulus had lapsed. In experiments made in a dark room, certain animals, which were accustomed upon the exposure of a light to go in its direction to obtain food, were restrained by the experimenter when the light was shown and released only after an interval. The length of time during which the animal could remember the direction in which the food lay varied from a few seconds in the case of rats to one minute for raccoons and five minutes for young children. It was found further that during the intervals preceding successful trials all the animals, except the raccoons, preserved some form of bodily orientation towards the position of the light: a mode of behavior which suggests that the memory was not a matter of ideas, but merely a persistence of kinæsthetic sensation. Even in the case of the raccoons, a kinæsthetic localization might have continued for a minute without being evident in bodily posture. In general it may be said that those who affirm the occurrence of free ideas in animals base their arguments less upon positive experimental evidence than upon the genetic presumption that the developmental difference between man and animals is not so great as the absence of the idea in the latter would imply.

The term "memory" is often employed in a less exact sense to denote retention; so that any modification of behavior by past experience is held to involve memory, and the facts of memory are the facts of learning. (See LEARNING IN ANIMALS.) To this type of memory belongs associative memory, an explanatory phrase used to characterize a reaction given, not to its usual stimulus, but to some other stimulus which has occurred previously, together with the usual one. Consult general texts cited in ANIMAL PSYCHOLOGY; also Hunter, "The Delayed Reaction in Animals and Children," in *Animal Behavior Monographs*, vol. ii (New York, 1913), and Watson, *Behavior* (ib., 1914). See ANIMAL PSYCHOLOGY; INTELLIGENCE IN ANIMALS; INSTINCT; MEMORY.

MEM'PHIS. A city of ancient Egypt, situated about 12 miles south of modern Cairo, on the left bank of the Nile (Map: Egypt, E 2). It is said to have been founded by Menes, the first historical King of ancient Egypt, but this is as little probable as the statement in Herodotus that Menes gained the ground for building Memphis by diking off the Nile. King Uchoreus, whom Diodorus calls the founder of Memphis, cannot be identified. It is certain that a city called the White Wall stood on the spot from prehistoric times; this name (Leukon Teichos) was still attached to the citadel and the neighboring quarter of Memphis in the Greek epoch. The kings of the fourth to the sixth dynasty built their residences not very far from Memphis, and their pyramids are in the vicinity, but Memphis proper received its name and importance from the second King of the sixth dynasty (Pepy or Apopi I), who built his pyramid and residence not far west of the small ancient city of the White Wall. The name of that pyramid, Men-nofer (good abode), extended to the whole city and, corrupted to Menfe, came down to the classical writers. In the seventh century B.C. the Assyrians called the city Mempi; in the Bible the name has been corrupted to Moph and Noph. Memphis, which had a very favorable situation, near the head of the delta, became the capital of Egypt. In later times several dynasties preferred other capitals, but Memphis always remained at least the second capital of Egypt and the second city of the land in wealth and population. The conquests by the Ethiopians, Assyrians, and Persians do not seem to have affected it much, and the writers of the earlier Roman period still describe it as filled with temples and palaces of amazing size and beauty, the Iseum, the Serapeum, and others. The decline of the city was rapid after the Arab conquest (at which time it was still the seat of a governor), when Fostat (Old Cairo) was erected in the neighborhood. Fostat and subsequently Cairo were built of stones taken from the deserted buildings of Memphis, and thus it came about that the ancient city entirely disappeared. The only remarkable monuments left there at present are the two colossal statues of Ramses II (originally 42 feet high), lying on the mound near the modern village of Mit-Rahîneh and marking the entrance to the principal and earliest temple of Memphis, that of Ptah (Greek Hephæstus), and the centre of the White Wall. Abd-ul-Latîf, as late as the thirteenth century A.D., found remarkable ruins on the site of old Memphis. The insignificant rubbish mounds (of Mit-Rahîneh, Bedrashên, Ennagîzîyeh, etc.) extend 3 or 4 miles from north to south. The classical writers give very exaggerated accounts of the size of the city. The immense necropolis west of it, including the pyramids and tombs of Saqqara, still bears testimony, however, to the former importance of Memphis. The principal god of the city was Ptah, the master craftsman among the gods, who was believed to have formed the world; afterward the conception of this deity was called Ptah-Sokar (a combination of Ptah and Sokar, the god of the western suburb), embodied in the Apis bull and others. The numerous Phœnician merchants had a quarter of their own with a temple of Astarte.

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MEMPHIS. The commercial metropolis and largest city of Tennessee, a port of entry, and the county seat of Shelby County, situated on the Mississippi River, 454 miles below St. Louis and 739 miles above New Orleans (Map: Tennessee, A 4). Embracing 19.3 square miles, the city rests upon the lower or fourth Chickasaw Bluff, an undulating plateau that rises 32 feet above the flood tide of the river at the water front and about 77 feet at the eastern city limits. Among the public buildings are the customhouse and post office, county courthouse, costing $1,500,000, in which the municipal offices are installed, police station, costing $250,000, city and United States marine hospitals, and a market house. In addition there are the St. Joseph's (Roman Catholic), Baptist Memorial, and Tuberculosis hospitals and several private sanitariums and hospitals. The city contains also the Goodwyn Institute, Cossitt Library, a country and other clubs, and a number of fine modern business buildings. Educational institutions include a State normal school, medical departments of the University of Tennessee, and 37 private schools and colleges. The public-school system is composed of a central high school, a vocational school, and 35 grammar schools. In 1915 there was a total enrollment in the public schools of more than 22,000 pupils.

There are 13 State and four national banks, with a total capital stock of $5,848,624 and surplus and undivided profits amounting to $3,051,692. The clearings for the year ending July 1, 1914, amounted to $425,726,391. Memphis ships freight by 175 steamboats, and 11 trunk lines of railroad have terminals here. Two belt lines convey the heavy traffic. The river is spanned at this place by a massive cantilever bridge, 1900 feet in length over the channel, and continuing as a truss bridge into the lowlands of Arkansas, a total distance of 15,635 feet. This bridge is owned by the St. Louis and San Francisco Railroad. Another great steel bridge of the same character, but somewhat larger, is now (1915) being built by the Rock Island System. The railway lines entering the city are served by two large Union stations, costing $6,000,000.

On account of its situation at the head of deep-water navigation on the Mississippi, Memphis has become an important commercial, manufacturing, and distributing centre. It is one of the largest inland cotton markets of the world, the gross receipts for 1914 having been 1,129,553 bales and the net receipts 644,773 bales, which sold for $46,296,137. Memphis also ranks high as a hardwood lumber market, having 155 concerns in the business with an annual output valued at about $19,500,000; and it is of considerable importance as a cottonseed-oil producing centre, operating 12 oil mills, four refineries, and five by-products factories. Besides these there are repair shops of two railroads and more than 600 industrial plants within the city limits, embracing a large variety of products, the total value of which in 1914 was $45,242,000. In the same year the city distributed $24,000,000 worth of wholesale groceries, grains and foodstuffs amounting to $18,000,000, and $5,000,000 worth of candies and confectioneries.

The financial statement of Memphis for the year 1914 showed total receipts of $3,617,330, while its disbursements amounted to $3,234,305, the chief items of expenditure being $238,000 for the police department, $227,000 for the fire department, $164,000 for health, and more than $500,000 for education. The tangible assets of the city amounted to $18,454,000.

The site of Memphis was an ancient crossing place of the Indian tribes on both sides of the river. It was first visited by De Soto, May 8, 1541, who crossed the river here. The Bluff was seen by Marquette and Joliet in 1673, by La Salle in 1682, and by De Tonti in 1686, but none of these made a settlement there. Bienville, the French Governor of Louisiana, in his war with the Chickasaw Indians, came with a large force in 1739 and built Fort Assumption on the Bluff. Gayoso, the Spanish Governor of Louisiana, occupied it in 1795 and erected Fort Ferdinand, but abandoned it two years later when Capt. Isaac Guion, with a detachment of United States troops, arrived and built Fort Adams on the same site. On May 1, 1819, Gen. Andrew Jackson, Judge John Overton, and Gen. James Winchester, the proprietors of Memphis, laid out a small town on the Bluff and gave it its present name, after the Egyptian city. In December, 1826, Memphis was incorporated. The city suffered much during the Civil War when the Confederate gunboat fleet, under Commodore Montgomery, was destroyed by the Union fleet, commanded by Commodore Davis, and as a result Memphis came under the control of the Union armies until the close of the war. In 1855, 1867, 1873, 1878, and 1879 the city was ravaged by epidemics of yellow fever, and in the two latter years its very existence was imperilled. This disaster was followed by a collapse of its financial system, and, to avoid bankruptcy, the municipal charter was repealed (1879) by the State Legislature and the city reduced to a Municipal Taxing District of Shelby County. But the city quickly recovered, its indebtedness was bonded, and in 1893 its name and municipal form of government were restored. In 1895 the power to levy its own taxes was reconferred, and the city began a new career of progress and prosperity. Since then its growth has been rapid.

In 1909 the city was granted an amended charter which gave it the commission form of government, and this still continues in successful operation, the municipal powers being vested in a mayor and four commissioners. One of the first acts of the Taxing District government had been to install the Waring system of sewers, and this, with other sanitary measures, cleansed the city thoroughly and greatly reduced the mortality rate. More than 340 miles of sewer mains have been laid, and the city has acquired its own artesian water system, the wells, 350 to 500 feet in depth, furnishing an almost unlimited supply of clear, wholesome water. Memphis maintains a splendid system of woodland parks, embracing about 1000 acres and including a beautiful park driveway, 11 miles long, connecting the larger parks. To these have been added several extensive playgrounds for children. Five miles distant is a National Cemetery, in which are 14,039 graves, 8822 of unknown dead. Memphis is the see of a Protestant Episcopal bishop. Pop., 1850, 8841; 1860, 22,623; 1880, 33,592; 1890, 64,495; 1900, 102,320; 1910, 131,105, including 6467 persons of foreign birth and 52,441 negroes; 1914 (U. S. est.), 143,231; 1920, 162,351. Consult: Keating and Vedder, *History of the City of Memphis* (Syracuse, 1888); Young, *History of Memphis* (Knoxville, 1912).

MEMPHIS, Ancient and Primitive Order of. See Masons.

MEM'PHREMA'GOG. A lake situated in the Province of Quebec, Canada, and extending 7 miles into Vermont (Map: Vermont, E 2). It has an irregular shape, is 30 miles long by from 2 to 5 miles wide, and discharges its waters northeastward through the Magog River into the St. Francis. Along the west shore is a range of mountains, reaching a height (in Owl's Head) of about 3000 feet; the lake is noted for its picturesque scenery. It is a favorite summer resort; numerous handsome villas dot its shores; and in summer a steamer runs from Newport, Vt., at the south end, to the Canadian village of Magog at the north extremity.

ME'NA. A city and the county seat of Polk Co., Ark., 84 miles by rail south of Fort Smith, on the Kansas City Southern Railroad (Map: Arkansas, A 3). It has a public library, a beautiful natural park, and St. Joseph's Academy, and is a popular summer resort. Among its industries are the manufacture of lumber and the shipment of fruit and cotton. There are municipal water works. Pop., 1900, 3423; 1910, 3953.

MENA, mā'nȧ, Juan de (1411–56). A Spanish poet, born at Cordova. After studying at Salamanca he went to Rome. He was secretary to King John II of Castile and court historian. Despite this latter position, he had nothing to do with the *Crónica de Don Juan II.* For many years he was credited with having written the first act of the *Celestina* (q.v.), but that assignment is now rejected. The *Coplas de la panadera* were also ascribed to him, but this is no longer seriously maintained, and long ago Argote de Molina credited them to Iñigo Ortiz de Zúñiga. His principal work is *El laberinto de fortuna* (1496), a poem modeled on the *Divine Comedy.* The oldest manuscripts give it as a poem of 297 stanzas, but when in later manuscripts three more were added, it received the popular title *Las trezientas.* Consult Mena, "Cancionero," edited by R. Foulché-Delbosc, in the *Nueva biblioteca de autores españoles,* vol. xix (Madrid, 1912), and in the latest edition of Fitzmaurice-Kelly's *Bibliographie de l'histoire de la littérature espagnole* (Paris, 1913).

MENA, Pedro de (?–1693). A Spanish sculptor. He was born in Adra (Alpujanas), where he studied with his father, as he did later in Granada under Alonzo Cano. His first important work comprised several statues of saints for the convent of El Angel, Granada; this was followed (1658–62) by a commission for sculptures in high relief of 40 saints for the choir stalls of the Malaga Cathedral. In 1663 he was appointed sculptor to the cathedral chapter of Toledo, and he was also employed at Madrid, Cordova, and elsewhere. The greatest Spanish sculptor of the later seventeenth century, Mena excelled in the rendering of the nude and in the expression of fervid religious sentiment. He is at his best in single contemplative figures. His works include, besides those mentioned: a statuette of St. Francis, in the cathedral at Toledo; "A Madonna and Child with St. Joseph," in the church of St. Isidoro, Madrid; a "Crucifixion," in the church of Innestra Senoia della Gracia, Madrid; the equestrian statue of St. James, in the cathedral at Toledo. Consult Haendcke, *Etudien zur Geschichte der spanischen Plastik* (Strassburg, 1900).

MENABREA, mā'nȧ-brā'ȧ, Luigi Federigo, Count (1809–96). An Italian general and statesman. He was born at Chambéry in Savoy and was educated for an engineer. On completing his studies he entered the Sardinian army as lieutenant in the engineer corps, but was soon called to a professorship of mechanics in the military academy and at the University of Turin. In 1848 he was promoted to the rank of captain, served in the war against Austria, and was then employed on diplomatic business. During the War of 1859 Menabrea acted as chief of staff of the engineers in the Sardinian army. After the defeat of the Austrians by the French and the handing over of Savoy to France, he left the province to retain his Italian citizenship and was created a Senator by Victor Emmanuel and made chief of the Department of Engineers. In 1860 he became a lieutenant general and was director of the siege operations against Gaeta, where the King of Naples had taken refuge. It surrendered after a three months' siege, for which success he was made Count. In 1861 he succeeded Ricasoli as Minister of Marine, to which he added in 1862 the duties of Minister of Public Works. He assisted in framing the Treaty of Prague in 1866, which gave Venice to Italy. He was called in 1867, on the retirement of Rattazzi, to form a new cabinet. He continued to carry on the government until near the close of 1869, and in two years of his premiership did much for Italian stability, both at home and abroad. After resigning, Menabrea was appointed Italian Ambassador to London (1876) and Paris (1882). He remained at Paris for 10 years. He died at Chambéry, May 25, 1896. Among the works he wrote are: *Etudes sur la série de Lagrange* (Turin, 1844–47); *Le génie italien dans la campagne d'Ancône et de la Basse-Italie* (Paris, 1866); *République et monarchie dans l'état actuel de la France* (ib., 1871).

MENAC'CANITE. See Ilmenite.

MENADO, mȧ-nä'dō. The capital of the Dutch Residency of Menado in north Celebes. It is situated near the extremity of the northeast peninsula of the island, on both sides of the river Tondano (Map: East Indies, F 5). It has an ethnological museum and is defended by the old Fort Amsterdam. Its unsafe roadstead detracts greatly from its commercial importance, though it is the outlet for a large amount of coffee grown in the province. Pop., 1895, 8996; 1905, 10,578, including 694 Europeans.

MENÆCHMI, mē-nĕk'mē. One of the best comedies of Plautus, so called from the twin brothers whose resemblance to each other and the amusing situations arising from their confusion form the plot of the play. The comedy is one of the earliest preserved plays of Plautus. It suggested in part the plot of Shakespeare's *Comedy of Errors.* William Warner translated the comedy into English in 1595.

MÉNAGE, mȧ'näzh', Gilles de (Ægidius Menagius) (1613–92). A French lexicographer and linguist, the original, perhaps, of Vadius in Molière's *Femmes savantes,* born at Angers. Disliking the profession of an advocate, he renounced it, entered the Church, and fixed his residence in the convent of Notre Dame. Besides writing Latin verses and observations on the French language, he possessed a broad erudition, ranging from Hebrew and Greek to Italian. His *Dictionnaire étymologique, ou*

origines de la langue française (Paris, 1650–94; best ed. by Jault, 2 vols., Paris, 1750) and his *Origini della lingua italiana* (1669) are erudite and valuable works. His Latin poems, originally published in 1656, were issued in a sixth edition in 1673. The *Menagiana*, a record of his conversations and witticisms, were collected by his friends the year after his death and republished by La Monnoye in four volumes in 1729. Consult Dumont, *Gilles Ménage considéré comme poète* (Angers), and Samfiresco, *Ménage polémiste, philologue, poète* (Paris, 1902).

MENAGERIE, mĕ-năj′ĕr-ĭ. See ZOÖLOGICAL PARK.

MENAI (mĕn′ī) **STRAIT.** The channel which separates the island of Anglesey from the mainland of Wales (Map: England, B 3). It is 13 miles long and varies in width from about 250 yards to 2 miles, widening out north of Bangor into Beaumaris Bay. Navigation of it is hazardous, but the strait is nevertheless much used by vessels under 100 tons in order to save time. At the entrance of the strait the tides sometimes rise to a height of 30 feet, and the ordinary neap tide rises from 10 to 12 feet. The strait is spanned by a suspension bridge, built in 1819–26, and by a tubular bridge, built in 1849–50, which carries the London and Northwestern Railway across Britannia Rock.

MENAM, mȧ-näm′. The chief river of Siam. It rises in the northwestern part of that country and flows southward, emptying by several arms into the Gulf of Siam, after a course of about 700 miles, or 900 miles if its length is measured from the source of its large tributary, the Mei Ping (Map: Siam, D 4). The Menam is navigable for large steamers to Bangkok, 15 miles from its mouth, and for small vessels for about 250 miles. The river divides itself several times by arms rejoining farther down, and from June to November it overflows a large part of the surrounding country, leaving an alluvial deposit of extraordinary fertility. Thousands of tons of fish are caught and cured during the falling stages of the river at Pichai.

MENAN′DER (Lat., from Gk. Μένανδρος, *Menandros*) (342–c.291 B.C.). One of the greatest poets of the Attic New Comedy, born at Athens, of a distinguished family. By his uncle, Alexis, the eminent poet of the Middle Comedy, he was initiated into the dramatist's art; his philosophical education he received from association with Theophrastus and Epicurus. He was intimate also with Demetrius. He was handsome and fond of luxury. The greater part of his time he spent at his villa in the Piræus with his beloved mistress Glycera. When Ptolemy Soter gave him a flattering invitation to his court Menander declined, preferring his native city and easy independence to royal favor. About 291 B.C. he was drowned while swimming in the harbor of the Piræus. Menander is said to have won a victory on the comic stage at the age of 21. Yet during his lifetime he was less a favorite than his contemporary Philemon (q.v.). Of his 105 or 108 plays but eight won the highest place. After his death, however, he became the favorite above all other comic poets of his time and was much read and quoted far into the Christian era. Copies of his plays were known to Suidas and Eustathius; 23 of his plays, it is said, were known in Constantinople in the sixteenth century. A well-known statue in the Vatican has been regarded by some scholars as a statue of Menander and has been identified by them with the statue of him known to have been set up in the theatre at Athens; another statue of Menander is in the Boston Museum of Fine Arts. (Consult R. Delbrück, *Antike Porträts*, Tafel 20, Bonn, 1912.) According to ancient critics he was distinguished for his wit, the refinement and perfection of his language, and his ingenious plots, his analysis of emotions, and his penchant for moral maxims. Until recently scholars were obliged to form their opinions of his comedies chiefly from the adaptations of them by the Roman comic writers Plautus and Terence, even though they had over 1000 fragments of his plays, about 1650 verses, and a considerable collection of gnomes attributed to him. The latter collection has, however, suffered greatly from additions. The fragments are best published by Kock, *Comicorum Atticorum Fragmenta*, vol. iii (Leipzig, 1888). Within the last 20 years, however, our knowledge of Menander has greatly increased. Two leaves of papyrus containing new fragments were published by Nicole, *Le laborateur de Ménandre* (Basle, 1898), and by Grenfell and Hunt (Oxford, 1898). In the *Oxyrhynchus Papyri*, vol. iii (London, 1903), 100 more verses from one play were given by Grenfell and Hunt. In 1906 a papyrus fragment, giving in all 1200 lines from four plays, among them 500 from each of two plays, was unearthed by Gustave Lefebvre, and was published in 1907, at Cairo, as *Fragments d'un manuscrit de Ménandre*. This discovery has given rise to an immense number of editions and of papers in the learned periodicals. For the earlier and more important part of this literature, as for these fragments themselves, consult E. Capps, *Four Plays of Menander* (Boston, 1910). Through the fragments the plots of two of the plays at least can be made out quite clearly. On the whole the fragments have been disappointing: they hardly by themselves explain Menander's great reputation in antiquity. For a translation of the fragments of one play, consult C. H. Weller, "Menander's *Arbitrants*," in *The Classical Journal*, vol. viii, pp. 275–280 (Chicago, 1912–13). A complete translation of the fragments of Menander, by F. N. Allinson, is to appear in the Loeb Classical Library. Consult: W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911); J. W. Cohoon, "Rhetorical Studies in the Arbitration Scene of Menander's *Epitrepontes*," in the *Transactions of the American Philological Association*, vol. xlv (Boston, 1915).

MENANDER. A powerful Græco-Bactrian King who ruled at the beginning of the second century B.C. Strabo refers to some of his conquests and Plutarch records that on his death, 115 B.C., various towns contended for the honor of cherishing his ashes. The large number of coins that bear his name and the wide-extended territory over which they are found seem to point to a long reign and to a domain of considerable influence. He appears in Buddhistic literature as Milinda (q.v.).

MENANT, me-năn′, JOACHIM (1820–99). A French Orientalist, born at Cherbourg. He was a judge in several towns and finally vice president of the higher court at Rouen, resigning in 1890. For his skill in deciphering the cuneiform inscriptions and his valuable contributions to Assyrian literature he was made a member

of the Académie des Inscriptions. His numerous writings include: *Zoroastre* (1844; 2d ed., 1857); *Notices sur les inscriptions en caractères cunéiformes de la collection épigraphiques de M. Lottin de Laval* (1859); *Eléments d'épigraphie assyrienne: les écritures cunéiformes, etc.* (1860; 2d ed., 1864); *Les noms propres assyriens, etc.* (1861); *Inscriptions de Hammourabi, roi de Babylone (XVIe siècle avant J. C.), etc.* (1863), with J. Oppert; *Inscriptions du revers de plaque du palais de Khorsabad, traduites sur le texte assyrien* (1865); *Exposé des éléments de la grammaire assyrienne* (1868); *Les Achémenides et les inscriptions de la Perse* (1872); *Le syllabaire assyrien* (1873); *Annales des rois d'Assyrie, traduites et misses en ordre sur le texte assyrien* (1874); *Babylone et la Chaldée* (1875); *Documents juridiques de l'Assyrie et de la Chaldée* (1877), with J. Oppert; *Découvertes assyriennes: la bibliothèque du palais de Ninive* (1880); *Empreintes de cachets assyro-chaldéens relevés au musée britannique sur des contrats d'intérêt privé* (1883); *Les pierres gravées de la haute Asie: recherches sur la glyptique orientale* (part i, 1883; part ii, 1885); *Les langues perdues de la Perse et de l'Assyrie* (1885, 1886); *Ninive et Babylone* (1887); *Les fausses antiquités de l'Assyrie et de la Chaldée* (1888); *Les Hétéens* (1891), with A. H. Sayre; *Eléments du syllabaire hétéens* (1892).

MENANTES, mȧ-nän'tȧs. The pseudonym of Christian Friedrich Hunold (q.v.).

MEN'APHON, or CAMILLA'S ALARM TO SLUMBERING EUPHUES IN HIS MELANCHOLIE CELL AT SILEXEDRA. A story by Robert Greene, published under the title *Arcadia* in 1589, the year before the publication of Sidney's *Arcadia*. It contains some of the author's finest poems.

MÉNARD, mȧ'när', MICHEL BRANAMOUR (1805–56). A pioneer, born of French parentage at Laprairie, Lower Canada. At an early age he entered the service of a fur-trading company at Detroit and afterward went to Missouri as an Indian trader for his uncle. He became a chief of the Shawnee Indians and gained much influence over other tribes. About the year 1833 he went to Texas and engaged in trading with the Mexicans and Indians. Owing to his influence over the Indians he was able, upon the revolt of the Texans, to prevent the Indians from assisting the Mexicans. He was a member of the convention that declared Texas independent, and afterward served in the Congress of that State. In 1836 he bought a square league of land that included most of the site of the present city of Galveston and became in effect the founder of that city.

MENASH'A. A city in Winnebago Co., Wis., 93 miles by rail north by west of Milwaukee, on Lake Winnebago, at its outlet into the Fox River, on the United States government canal of the Fox and Wisconsin River Improvement and on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Wisconsin, E 4). It has a public library and there are paper mills, a woodenware factory, flour, saw, and woolen mills, machine shops, brickyards, and manufactories of lumber products. Lake Winnebago is a popular summer resort. Settled in 1847; Menasha was incorporated first in 1874. The present government is administered under a charter of 1892, which provides for a mayor and a unicameral council. The city owns its water works and lighting plant. Pop., 1900, 5589; 1910, 6081.

MENASSEH BEN ISRAEL, me-näs'ĕ bĕn iz'rȧ-ĕl (1604–57). A Jewish writer and leader, born at Lisbon, Portugal. His family emigrated to Holland, where he became a rabbi and where he established the first Hebrew press in that country. His reputation was won by publishing *El conciliador* (4 vols., 1632–51), and he became a director of a Jewish college. An English translation of his tract, *Esperança de Israel* (Hope of Israel), appearing in 1650, markedly influenced English public opinion in behalf of the Jews. In 1655 he visited London to urge the Commonwealth government to grant to Jews right of residence in England. Upon his arrival there he issued his *Humble Addresses* to the Lord Protector, which called forth Prynne's *Short Demurrer*. The courts declared that there was no law forbidding the Jews to return. In 1656 Menasseh ben Israel published his brilliant refutation of calumnies against the Jews, *Vindiciæ Judæorum*.

MENCIUS, mĕn'shŭs (Latinized form of Chinese MÊNG-TSE or MUNG-TSE) (c.371–287 B.C.). A Chinese sage, ranking next after Confucius in the estimation of the Chinese. He was born about 371 B.C. (108 years after the death of Confucius), in the small Principality of Tsŏu in the present Province of Shantung, at no great distance from the birthplace of Confucius. As a youth he was known as Mêng K'o. His father died when the future philosopher was only three years old. The widow gave the fatherless boy every attention, and in due course he went to school, but does not seem at first to have been specially diligent or enthusiastic in his studies. It is said that he studied later with the disciples of Tszŭ-tse, the grandson of Confucius, and from them learned the doctrines of the master, of whom he became an enthusiastic admirer. When he was 40 he appeared as a public teacher with a large following of disciples. Like Confucius, he moved about from state to state, inculcating, expounding, and amplifying the Confucian teaching. He was more courageous and outspoken than Confucius and was fearless in following his teachings to their logical consequences. He taught that man's nature is good, though it may appear otherwise, and that all his vices and all his misfortunes are due to evil influences from without. Humanity, righteousness, propriety, and knowledge are as natural to man as his four limbs. He condemned warfare and held that man should and need not fight, but should be benevolent, for "the benevolent man has no enemy." He regarded wars as unjust in the main, and an instigator of wars as a criminal. What is wanted is a return to this original goodness, and this can be accomplished only by the rectification of the heart. He laid special stress on humanity and righteousness, one the complement of the other, as the two main elements in man's moral being, humanity representing the fullness of virtue in the individual and righteousness the due observance of all man owes to his fellow men. "Humanity is internal," he says; "righteousness external." "There has never been a man trained to humanity who neglected his parents; nor one who, having been trained to righteousness, made his sovereign an after consideration." Mencius was well versed in historical, political, and economic questions, in which his views were always

rational and the result of deep understanding. In politics he taught that government is from God, but is *for* the people, whose welfare is of supreme importance; and he emphatically inculcated the application of these two principles, humanity and righteousness, to the conduct of rulers. And he did not hesitate to indicate the duty of the subject in regard to the removal of oppressive rulers or wicked men in high places, when asked if a subject might put his sovereign to death. "He who outrages the humanity proper to his nature," he said, "is called a robber; he who outrages righteousness is called a ruffian. The robber and the ruffian we call a mere fellow. I have heard of the cutting off of Chóu-sin [the ferocious tyrant and last Emperor of the Shang dynasty, 1123 B.C.], but I have not heard in his case of putting a sovereign to death";—only a cruel monster, a mere fellow. With Mencius the happiness of the people is the first essential, and loyalty to the sovereign, as taught by Confucius, of secondary importance.

Mencius died at 84, after passing the last 15 years of his life in retirement, during which he edited the *Book of History* and the *Book of Poetry* and prepared with the aid of some of his disciples a record of his sayings and of his conversations with the princes—a fact which may account for their greater fullness as compared with those of Confucius. It is the last of the *Four Books* which form the basis of the Confucian philosophy. He was buried near the present Tsóu Hien, in Shantung, where there is a temple in his honor and where his descendants still dwell. It was not till the second century A.D. that his writings were fully studied and appreciated. In 1083 he was created Duke of Tsóu; in 1088 he was admitted into the Temple of Confucius as an Associate, and titles were conferred on his father and mother.

Bibliography. Rémusat, *Nouveaux mélanges asiatiques*, vol. ii (Paris, 1829); Legge, *Chinese Classics*, vol. ii (London, 1861), containing the Chinese text of the Mencian discourses, with a translation in English, Critical Notes, Prolegomena, and a Life; Faber, *Ene Staatslehere auf ethischer Grundlage, oder Lehrbegriff des chinesischen Philosophen Mencius* (Elberfeld, 1877), or Hutchinson's translation, *The Mind of Mencius* (London, 1880); Johnson, "China," vol. ii, in *Oriental Religions and their Relation to Universal Religion* (Boston, 1878); Watters, *A Guide to the Tablets in the Temple of Confucius* (Shanghai, 1879); E. H. Parker, *Studies in Chinese Religions* (London, 1910); Friedrich Hirth, *The Ancient History of China* (New York, 1911).

MENDAÑA DE NEYRA, mȧn-dä'nyȧ dȧ nā'ē-rȧ, ALVARO DE (1541–95). A Spanish navigator, born in Saragossa. He went to Peru in 1565, and had resided some time at Lima when his uncle, Lope García de Castro, the Viceroy of the country, in 1567 put him in command of an expedition for purposes of discovery among the islands of the Pacific. Among his discoveries was that of a group of islands which he named Solomon Islands, on the pretense of believing that here Solomon obtained the gold used in the temple at Jerusalem. Returning to Lima in 1568, he circulated reports of the wealth of these islands, which led, 27 years later, to an expedition for their colonization, of which he took the command. Sailing from Callao April 11, 1595, he discovered another group of islands, which he named the Marquesas, after the wife of the Viceroy of Peru, the Marchioness Mendoza. Other groups of islands were visited, but Mendaña died without having reached the end of his voyage. Mendaña's narrative of his expeditions is in the National Library at Paris. This, with other contemporary accounts of the expedition, is translated in the Hakluyt Society publications for 1901, edited by Lord Amherst of Hackney and Basil Thomson (2 vols., London, 1901). Consult also Justo Zaragoza, *Historia del descubrimiento de las regiones australes* (Madrid, 1876–82).

MENDAÑA ISLANDS. See MARQUESAS ISLANDS.

MENDE, mȧnd. The capital of the Department of Lozère, France, on the left bank of the Lot, 110 miles southwest of Lyons. It is situated at the foot of a cliff rising 1000 feet above the town (Map: France, S., H 4). Its cathedral of St. Peter was founded in the fourteenth and rebuilt in the seventeenth century, with two towers, 280 and 210 feet high. In front of it stands a bronze statue of Pope Urban V, a native of the town. The town has also several normal schools, a communal college, and a library. It is the seat of a bishop. The chief industry is the manufacture of woolens, flannels, serges, and shalloons. Pop. (commune), 1901, 7319; 1911, 7005.

MENDEANS, mĕn-dē'*a*nz. See CHRISTIANS.

MEN'DEL, GREGOR JOHANN (1822–84). An Austrian botanist. He was born at Heinzendorf, Austrian Silesia, and in 1843 entered the Augustinian Königinkloster at Brünn. He became a priest in 1847; studied at Vienna (1851–53); returned to the cloister; taught at Brünn, and became abbot. While Mendel was teacher of natural science in the Brünn Realschule (1853–68) he was largely occupied with experiments in hybridization, with a view to obtaining some evidence as to the laws of heredity. His results are discussed under MENDEL'S LAW (q.v.). After 1873 Mendel's duties as abbot at Brünn prevented further biological work. See HEREDITY.

MENDELÉEV, myĕn'*de*-lĕ'yĕf, DMITRI IVANOVITCH (1834–1907). A Russian chemist, born in Tobolsk, Siberia. He graduated from the local Gymnasium and in 1850 entered the Institute of Pedagogy of St. Petersburg, where he applied himself to the study of natural sciences. In 1856 he was appointed docent at the University of St. Petersburg and in 1859–61 he worked in Heidelberg and published a monograph *On the Capillarity of Gases*. Shortly afterward he published his *Organic Chemistry*. He was made professor of chemistry at the St. Petersburg Institute of Technology in 1863, and three years later at the university. In 1871–75 he made extensive studies on the compression of gases, embodied in his *On the Elasticity of Gases*. In 1876 he was commissioned by the authorities to study the petroleum industry in Pennsylvania and the Caucasus. His work on *Aqueous Solutions* (1886) was received by chemists as a notable contribution to experimental chemistry, although his "theory of solutions," according to which solvents invariably form chemical compounds with the substances dissolved in them, has been strongly criticized by physical chemists of the modern German school. As member of the Council of Commerce and Industries, Mendeléev was the champion of protection of home industries, and the policy of Russia in that direction dates practically from the publica-

tion of his *Tariff Elucidated* (1890). He worked out the formula for the *pyrocollodial* smokeless powder, serviceable for all firearms, when Russia undertook to rearm her forces. In 1893 he was made conservator of weights and measures in the new Chamber of Weights and Measures established in the Department of Finance.

His *Elements of Chemistry* (1st ed., 1868–70; 3d Eng. trans. from the 7th Russian ed., 1905) is a standard work and has been translated into German and French, as well as English. In it he first set forth his celebrated principle, later embodied in *La loi périodique des éléments chimiques* (Paris, 1879), and now generally known as the periodic law (q.v.), viz.: "The properties of the elements, as well as the forms and properties of their compounds, are in periodic dependence on, or form a periodic function of, the atomic weights of the elements." This law enabled Mendeléev to foretell the existence and even the properties of several unknown elements, which have since been actually discovered. Mendeléev is also the author of an interesting hypothesis on the nature of the universal ether embodied in *Attempt toward a Chemical Conception of the Ether* (Eng. trans., New York, 1904). His scientific contributions (over 150), dealing mostly with physical chemistry, have appeared in German and French scientific periodicals. Consult T. E. Thorpe, *Essays in Historical Chemistry* (London, 1902).

MENDELISM. See MENDEL'S LAW.

MENDEL'S LAW. A law of heredity announced in 1865 by Gregor Mendel (q.v.) in the *Proceedings* of the Natural History Society of Brünn, under the title *Versuche über Pflanzenhybriden.* It attracted no attention until 1900, when it was brought to light simultaneously by De Vries (Holland), Correns (Germany), and Tschermak (Austria), who were conducting genetic experiments with plants. This law has now become the working basis of most of the investigations in genetics. Mendel chose for his experiments the garden pea (see PISUM), because the plants are grown easily, the generations are short, and the contrasting characters are sharp. For example, in the various races the colors of the flowers are purple, red, or white; the mature seeds are smooth or wrinkled; the stature of the different races is either distinctly tall or just as distinctly dwarf. Hybrids were used because by this means the contribution of each parent could be recognized. Mendel's genius as an experimenter was indicated by the fact that, instead of studying the total results of inheritance through successive generations, he selected a single pair of contrasting characters, neglecting all other characters. These contrasting characters were traced through a series of generations, and, since all behaved alike, Mendel was able to formulate his general law. A single illustration will indicate the results obtained from all of the characters. When purple-flowered and white-flowered forms were crossed, all of the hybrid progeny were purple-flowered. In genetics this first hybrid generation is called the F_1 generation. The disappearance of the white character in the F_1 generation, followed by its reappearance in the next generation, led to the conclusion that the white character is present in all of the F_1 individuals, but does not express itself on account of the presence of the purple character; therefore, purple was said to be "dominant" over white, which was said to be "recessive." Mendel's law appears, however, in the behavior of the next generation (F_2). In the F_2 generation three kinds of individuals appear in a definite ratio, which becomes evident if four individuals are selected as an illustration. One of the four is a pure purple individual, as shown by breeding true generation after generation; a second is a pure white individual, as shown by subsequent breeding; while two of the four are purple individuals, but contain the white character as a recessive, as shown by subsequent breeding, behaving simply like all of the individuals of the F_1 generation. This ratio is expressed in two different ways: (1) by writing it 1 : 2 : 1, thus indicating the occurrence and proportion of the three kinds of individuals; or (2) by writing it 3 : 1, which in the experiment cited indicates that there are three purple individuals to one white one. Of course this latter expression does not show that there are two kinds of purple individuals. In general Mendel's law is often described as showing that hybrids "split" into the definite ratio 3 : 1. Involved in the law, however, is the idea of "unit characters," which means that characters retain their individuality, being transmitted intact and not blending with other characters. When two characters are mutually exclusive, one of them is always "dominant" over the other, which is then said to be "recessive." Mendel's explanation of this behavior of unit characters is that paired characters received from the two parents are segregated in the germ cells (eggs and sperms) of the progeny, so that each germ cell contains only one of the characters. In such a case there would be two kinds of eggs and sperms, and the chance of mating is expressed by the Mendelian ratio. For example, an egg of the pea in the experiment cited could contain either the purple character or the white character, but not both; i.e., two contrasting characters are mutually exclusive in the germ cells. The most fundamental feature, therefore, of Mendel's law is the theory of the so-called "purity of the germ cells" in reference to characters. Consult: William Bateson, *Mendel's Principles of Heredity* (New York, 1909); R. H. Lock, *Recent Progress in the Study of Variation, Heredity, and Evolution* (ib., 1906; new ed., 1910); R. C. Punnett, *Mendelism* (3d ed., ib., 1911); A. D. Darbishire, *Breeding and the Mendelian Discovery* (ib., 1911). See BREEDING; HEREDITY; HYBRIDITY.

MENDELSSOHN, mĕn'del-sōn, MOSES (1729–86). A German philosopher of Jewish parentage. He was born Sept. 6, 1729, at Dessau. From his father, a schoolmaster and scribe, he received his first education; and in his thirteenth year proceeded to Berlin, where, amid very indigent circumstances, he contrived to learn Latin and modern languages and to apply himself to the study of philosophy. After many years of comparative poverty he became part heir to a rich silk manufacturer, whose children he had educated. The intimate friend of men like Lessing—whose *Nathan der Weise* had its prototype in him—Sulzer, and Nicolai, he contributed in a vast degree to the mitigation of the brutal prejudices against the Jews. On the other hand, he broadened the outlook of his own coreligionists. He died Jan. 4, 1786. His principal works are: *Pope, ein Metaphysiker* (1755), with Lessing; *Briefe über die Empfindungen*

(1755); *Ueber die Evidenz in den metaphysischen Wissenschaften; Phädon, oder über die Unsterblichkeit der Seele* (1767); *Jerusalem, oder über religiöse Macht und Judenthum* (1783); *Morgenstunden* (1785). His works have been collected and edited by G. B. Mendelssohn (7 vols., Leipzig, 1843–45). Consult: Hensel, *Die Familie Mendelssohn* (9th ed., Berlin, 1898; Eng. trans., London, 1882); Kayserling, *Moses Mendelssohn* (Leipzig, 1882); Ritter, *Mendelssohn und Lessing* (Berlin, 1886); Dessauer, *Der deutsche Plato* (ib., 1879); Galestein, *Moses Mendelssohn und die deutsche Æsthetik* (Königsberg, 1904). His philosophy was of a rather superficial popular sort, whose aim was to find good reason for opinions currently regarded as correct.

MENDELSSOHN-BARTHOLDY, mĕn'del-sōn-bär-tōl'dĭ, Felix (1809–47). A famous German composer. He was born at Hamburg, Feb. 3, 1809, the son of Abraham Mendelssohn and Leah Salomon. The latter's brother, after embracing Christianity, assumed the name Bartholdy, which the Mendelssohns then added to their family name. The family was wealthy and highly refined. Felix's grandfather was the celebrated Moses Mendelssohn (q.v.). His children were brought up in the Protestant faith. Felix received piano instruction first from his mother; afterward Ludwig Berger became his teacher. His instructor in counterpoint and musical composition was Zelter; and the finishing touches to his skill as a pianist were given by Moscheles. His eldest sister, Fanny, shared this instruction.

Mendelssohn began to compose before he was 12 years of age, and also showed great taste in drawing, and was rapid, yet accurate, in his general studies. Notwithstanding his remarkable achievements for one so young, his education continued on broad lines. Much of the charm which he exerted through life was due to his combining with musical genius the tastes of a man of high culture. When 11 years old he paid a visit to Goethe, who was delighted not only with his musical accomplishments but with his modesty and refinement.

The home of the Mendelssohns was the centre of a cultured circle. At the Sunday concerts which were given there the most eminent people residing or visiting in Berlin were met—musicians like Weber, Spohr, Paganini, Liszt, Schumann; painters like Ingres, Vernet, Verboeckhoven, Kaulbach; singers like Lablache, Grisi, Pasta; and in addition to these, actors, sculptors, poets, and scientists, among the latter the Humboldts, Bunsen, and Jakob Grimm. One can imagine the rich life which unfolded itself within such a circle and its influence upon Felix's development. One of the intimates of the circle was Hensel, the portrait painter, who married Fanny, herself scarcely inferior to Felix at the piano. Notwithstanding his pronounced musical gifts, Felix's father, in order to make sure that he was acting wisely in the choice of a musical career, took him in 1825 to Cherubini in Paris. After examining several of the boy's compositions, Cherubini gave an affirmative answer. In the same year Mendelssohn composed his octet (Opus 20). In February, 1827, his *Midsummer Night's Dream* overture was played at Stettin and was received with great applause. April of the same year saw the production of his opera, *The Wedding of Camacho*, in Berlin, but it was not a success.

In 1828 he composed his overture to Goethe's poem, *A Calm Sea and a Happy Voyage;* and a letter from Fanny, Dec. 8, 1828, to his friend, the poet Klingemann, refers to his composition of *Songs without Words.* One of Mendelssohn's finest achievements, the first performance since Bach's death of the *St. Matthew Passion,* took place in Berlin in 1829. The greatest difficulties had to be overcome, not the least being the indifference of musicians and public, but Mendelssohn brought the affair to a triumphant issue, and thus gave the first impetus to the great Bach revival through which that composer at last obtained due recognition. In April, 1829, Mendelssohn made the first of several visits to England, where his former teacher, Moscheles, was settled. He was well received socially, and his concert appearances both as pianist and composer were highly successful. He made a tour of Scotland and visited the Hebrides. During a visit to the ruined palace of Holyrood, with its traditions of Queen Mary, he hit upon the beginning of his *Scotch Symphony;* and his trip to the islands inspired his *Hebrides* or *Fingal's Cave* overture. The germ of his *Reformation Symphony* also dates from this time. The *Scotch Symphony,* however, was not completed until many years later, having its first performance in Leipzig in March, 1842, and in London at a Philharmonic concert in June of the same year.

In 1830 he declined an offered professorship of music in the University of Berlin, and in the same year he traveled to Italy. In Rome he began one of his most important works, the cantata to Goethe's *First Walpurgis Night,* and in a letter to Fanny, dated from Rome, in February, 1831, he writes that the *Italian Symphony* is making great progress. After various travels, including visits to Paris and London, where his appearances again were highly successful, he accepted an invitation to conduct a music festival at Düsseldorf. This led to his taking, in 1833, the post of musical director of the city, where he remained, quickening the musical life of the place and engaging in the composition of the greater part of his oratorio of *St. Paul,* until 1835, when he became conductor of the famous Gewandhaus concerts in Leipzig. Here his activity was of the utmost importance. He not only brought the orchestra to a high state of perfection, but he was chiefly instrumental in the founding of the Leipzig Conservatory.

His oratorio of *St. Paul* was brought out at the Lower Rhenish Musical Festival (q.v.), at Düsseldorf, under his own direction, in May, 1836. In 1837 he married Cécile Jean-Renaud, the daughter of a French clergyman in Frankfort. The union was a most happy one. During his incumbency at Leipzig he made frequent tours, and in 1841 went, at the invitation of Frederick William IV, to Berlin, and at his instigation composed the music to *Œdipus, Œdipus Colonos,* and *Antigone; Athalie;* and the rest of his music to the *Midsummer Night's Dream.* Late in 1842 he returned to Leipzig. Previously during that year he had visited England for the seventh time, and by invitation had played for Queen Victoria and the Prince Consort at Buckingham Palace. In 1844 he was again in England, and in August, 1846, brought out with overwhelming success at the Birmingham festival his oratorio *Elijah.* In 1847 the sudden death of his beloved sister Fanny came as a great shock to him, and his system, weak-

ened by overwork, succumbed. In September, in Leipzig, while listening to his own recently composed *Night Song*, he swooned away. Nervous prostration followed, and on November 4 he died.

Probably no composer ever was so fêted during his lifetime or lost so much ground after his death as Mendelssohn. He was the idol of the public and a large circle of friends. In England his popularity amounted to a Mendelssohn worship. His music, polished like himself, perfect in form, melodious, easily understood, and not too difficult technically, immediately became popular in concert and drawing rooms. It presented no problems and solved none. He was, as a rule, a rapid producer; the music to *Antigone* was composed in 11 days. But the very quality which made his music attain such immediate popularity, a certain superficial prettiness, has caused much of it to be laid aside. His oratorios are still given, and the *Elijah* especially holds its own; the violin concerto is an admirable composition; the *Midsummer Night's Dream* overture has fairylike grace; certain *Songs without Words* and the *Variations sérieuses* have a definite value in the pianoforte curriculum; and several of his choral works are highly valued. But the bulk of his product, including his fine symphonies, is less and less heard of. As a conductor, his attitude towards new departures was not friendly. Wagner's *Tannhäuser* overture he played at a Gewandhaus concert "as a warning example." But for Bach and the appreciation of Beethoven's later works he did much.

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MENDELSSOHN SCHOLARSHIP. The most valuable musical prize in Great Britain, which entitles its holder to a course of study abroad. The movement for founding such a scholarship began in 1848, when the proceeds from a performance of *Elijah* were set aside for the purpose. In 1856 the first scholar, Arthur Sullivan, was elected. The capital has been gradually added to until the annuity now consists of about $500. There is also a Mendelssohn scholarship in Berlin, whose value is about $720, half of which is awarded to composers and half to virtuosos.

MENDENHALL, mĕn′den-hąl, George (1814–74). An American physician. He was born at Sharon, Pa.; graduated Ph.D. from the University of Pennsylvania in 1835; and in 1843 established himself in Cincinnati, where he specialized in obstetrics. In Miami Medical College he served as professor of obstetrics and as dean. In 1870 he was president of the American Medical Association. He was the author of *Medical Students' Vade-Mecum* (1852).

MENDENHALL, Thomas Corwin (1841–). An American physicist, born near Hanoverton, Ohio. He received a common-school education, became professor of physics and mechanics in the Ohio State University in 1873, and in 1878 accepted the chair of physics in the Imperial University at Tokyo, Japan. His labors there were later incorporated into the government meteorological system; and his interest in the phenomena of earthquakes led him to help found the Tokyo Seismological Society. Returning to Ohio State University in 1881 as professor of physics, he developed the State weather service. Three years later he was called to the United States Signal Service at Washington. In 1886 he was appointed president of Rose Polytechnic Institute, Terre Haute, Ind.; in 1889 he became superintendent of the United States Coast and Geodetic Survey; and in 1894–1901 he was president of the Worcester Polytechnic Institute. In 1889 he served as president of the American Association for the Advancement of Science, and in 1911 he was decorated with the Order of the Sacred Treasure of Japan. He made several important contributions to physical science and is the author of *A Century of Electricity* (1887).

MENDENHALL, Walter Curran (1871–). An American geologist, born at Marlboro, Stark Co., Ohio. He graduated from Ohio Normal University in 1895 and studied at Harvard (1896–97) and at the University of Heidelberg (1899–1900). On the United States Geological Survey he served as assistant (1894–96), assistant geologist (1896–1901), and geologist after 1901. In 1907–10 he had charge of the ground-water investigations of the United States and in 1910 he became chief of the Land Classification Board. The results of his work in various States and in Alaska and Hawaii were published in government reports and bulletins and in contributions to the scientific press.

MENDERES, mĕn′dĕr-ĕz. The modern name of the Mæander (q.v.), a river of Asia Minor.

MENDÈS, mäN′dâs′, Catulle (1841–1909). A French poet, novelist, and playwright, born in Bordeaux. He founded (1859) the *Revue Fantaisiste*, devoted to the interests of the Parnassian poetic group. In 1866 he was married to Judith Gautier (q.v.), but they soon separated. His *Poésies* appeared in 1872 (new ed., 3 vols., 1892), and *Les braises du cendrier* (1900) is also verse. Although accomplished and versatile as a poet, Mendès lacked the inspiration that would have placed him with Coppée or Sully Prudhomme. Among his novels are: *Histoires d'amour* (1868); *Le roi vierge* (1880), the best known; *Mephistophela* (1890); *Gog* (1896). His plays include: *La part du roi* (1872); *Les frères d'armes* (1873); *La justice* (1878); *Le femme de Tabarin* (1887); *Médée* (1898); *La reine Fiammette* (1898); *Scarron* (1904); *Glatigny* (1906); *Sainte-Thérèse* (1906), in which Sarah Bernhardt appeared with success. Definitive collections of his plays appeared as *Théâtre en prose* and *Théâtre en vers* (both 1908). He wrote librettos for Chabrier's *Gwendoline*, Hahn's *Carmelite* (1902), Erlanger's *Le fils de l'étoile* (1904), and Massenet's *Ariane* (1906) and *Bacchus* (1909). In criticism he published *Richard Wagner* (1886); *L'Art au théâtre* (1896–1900); *Le mouvement poétique, 1867–1900* (1903).

MENDES LEAL, mäN′dĕsh lâ-äl′, José da Silva (1820–86). A Portuguese dramatist, statesman, and diplomat, born at Lisbon. He produced a number of plays which have been

very successful. The following are the best: *Os dous renegados* (1839); *Egas Moniz* (1861); *Madre Silva* (1847); *A pobre das ruinas* (1846); *Os homens de marmore* (1854); *Os homens de ouro* (1855); *Pedro* (1857); *A escala social* (1858); and especially the comedies *O tio André que vem do Brazil* (1855) and *Receita para curar saudales* (1857). He became a member of the Portuguese Academy (1845) and was director of the National Library (1850–67). As early as 1851 he was elected to Parliament, served twice as Minister of State, was elected President of the Chamber of Deputies in 1868, and was raised to the peerage in 1871, after which he entered the diplomatic service. Consult A. Romero Ortiz, *La literatura portuguesa en el siglo XIX* (Madrid, 1869).

MENDES-PINTO, mĕn′dĕsh-pēn′tô, Fernão. See Pinto, Fernão Mendes.

MENDI. See Semang.

MENDIBURU, mĕn′dē-boo′roo, Manuel de (1805–85). A Peruvian statesman and historian, born in Lima. He was educated at the University of San Marcos. When the movement for independence reached Peru, he joined the patriot army as color sergeant in 1821. As lieutenant he distinguished himself in various battles, and after the conclusion of the war was made captain (1830) and by 1851 had reached the rank of general. In 1831 he was sent on special missions to Brazil and Spain. From 1834 to 1870 he was employed in the government service, filling successively the positions of prefect of various departments; holding the portfolios of Government, Treasury, Foreign Relations, and War and Marine; serving as deputy in congress, Vice President of the Constituent Assembly, and Minister of Peru to England, to Bolivia, and to Chile. In 1870 he was placed in charge of the School of Arts and Trades at Lima. During his long and active political career he found time for writing and historical study. His *Diccionario histórico-biográfico del Perú* (1874–85) is a monumental work based upon manuscript sources, existing in the Archivo Nacional de Lima, which he reorganized, and is invaluable for the study of Peruvian history, especially during the colonial epoch.

MEN′DICANCY (from *mendicant*, from Lat. *mendicans*, pres. p. of *mendicare*, to beg, from *mendicus*, poor). The practice of begging. A beggar is one who seeks to get his living, in whole or in part, by soliciting alms. The word "beggar" is probably derived from the Beghards, a religious order of the Middle Ages corresponding to a similar order among women, the Beguines (q.v.). Small communities of the Beguines still exist in Belgium.

In primitive societies beggars have little chance for existence. Whenever and wherever a surplus results from labor, there appears a class of the economically unfit ready and anxious to live as parasites on the labor of others. If, through the influence of religion or other causes, almsgiving comes to be looked upon as a virtue, mendicants will rapidly increase. Such a condition existed in Europe in the Middle Ages, and beggars became so numerous that they threatened to overrun the Continent. The Church inculcated almsgiving and emphasized it as a means of obtaining future happiness. The great success of the orders of the begging friars, the Franciscans, Dominicans, Carmelites, and Augustinians, encouraged begging among the laity. Meantime there was a gradual development of monasteries, hospitals, guilds, and private benevolence, entirely independent of each other, yet all giving alms, and this without any thought of investigation as to the worthiness of the recipient.

In 1349 England began to forbid begging. France followed in 1350, and later some of the German towns, as Esslingen (1384) and Brunswick (1400). Such legislation was of little effect. During the fifteenth century the idea gradually gained ground that the able-bodied poor must be set at work. The adoption of this view involved the overthrow of the old theory of almsgiving, and it was steadily opposed by the Church.

The sixteenth century marks a great change. Luther said that one of the most crying needs of Christian countries was the prohibition of begging, and measures to this effect introduced in the "Regulation of the Common Chest" became the basis for subsequent reforms. Under the influence of Zwingli, Zurich prohibited begging in 1525. The Catholic Vives wrote *De Subventione Pauperum* (Bruges, 1526), which led to the breakdown of the old system in Catholic Europe, in the north at least, for in Spain, through the influence of the Dominican monk Soto, the prohibition was not decreed, and Italy has only partially forbidden the custom.

Germany after the Thirty Years' War made more stringent regulations, but the various states were not in harmony, and the root of the evil was not reached. Frankfort (1620), Anhalt (1770), Hesse (1777) forbade begging entirely. Hamburg followed in 1788 and forbade also gifts to beggars. Here was introduced more effective investigation of the individual cases, and other cities copied the plan. By 1791 it is reported that open begging had been stopped. The general German law is that vagabonds (Landstreicher—best translated "tramps") may be imprisoned. Beggars, those who ask alms either in person or through letters, may be put to hard work. In some of the states appeals for assistance may not be published in the papers without special permission. Bavaria made a statistical investigation of mendicancy between 1870 and 1880 which showed that some 20,000 persons were convicted each year. In Saxony, between 1880 and 1887, of those convicted 47 per cent were Saxons, 42.7 from other German states, and 10.3 foreigners. In many towns there is a Verein gegen Verarmung und Bettelei.

France forbade mendicancy in 1566, but the efforts made to enforce the law were ineffective. In 1627 it was ordered that beggars be impressed into the navy. Later, beggars were commanded to leave Paris under penalty of being sent to the galleys. After the Revolution, however, penal colonies, dépôts de mendicité, were established.

Italy prohibited begging in 1865, but local authorities may issue permits (permissi di mendicare), and begging, licensed or not, abounds, particularly in the southern provinces.

The practice has also been prohibited in other countries—Denmark (1789, 1803, 1860), Norway (1863), Russia (1864), Sweden (1885). In Mohammedan lands, where almsgiving is still a religious obligation, beggars abound.

England in 1536 decreed that an able-bodied beggar should be whipped for the first offense, have his ears cropped for the second, and be executed as a felon and common enemy for the third. In 1547 he was to be branded and be-

come the slave of any one who would care for him for two years. In the Act of 1536 "common and open doles" were prohibited, and the parish authorities instructed to care for the worthy poor. The civic authorities were still trying various schemes. Oxford had four "bedells of the beggars" who "took a ward every Friday to gather the devotion of the houses" and on other days "daily the streets to walk, to look what other beggars or vagabonds do come into the city and then to give notice to the constables." In Southampton in 1540 a "master of beggars" with a silver gilt badge and small annual fee is mentioned. York (1538) decided that "from henceforth no Headbeggars shall be chosen," and by the end of the reign of Elizabeth the other towns had followed her example. In 1562 compulsory labor was made possible. In 1601 came the famous poor law of Elizabeth (43 Eliz., c. 2) which emphasized the necessity for work; 1676 marked the establishment of the first workhouse at Bristol; and with these changes the modern system is inaugurated. Yet begging was not abolished, and in Scotland (see *The Antiquary*, Walter Scott) in the early part of the nineteenth century the Bedesmen or Blue Gowns were licensed. The present English law is that of 1824. Habitual begging is a criminal offense, punishable in a summary manner, i.e., without trial by jury. (See VAGRANT.) For the first offense one may be committed as "idle and disorderly" to one month at hard labor; for the second offense as a "rogue and vagabond" for three months; for a third as an "incorrigible vagabond" for one year. One who solicits charitable contributions by lying letters, false writings, or any other cheat is liable to punishment for obtaining money under false pretenses (q.v.). If begging be accompanied by threats of violence, it may subject the offender to punishment for robbery (q.v.).

In the United States mendicancy has been looked upon as bad and is generally forbidden. The laws have been very leniently enforced and in many places are almost dead letters. Only one State, Massachusetts, has provided a farm colony to which beggars may be sent and made to work. In some cities energetic steps are being taken to make begging unprofitable, and special attention is being paid to parents who send young children out to beg, or who cover their begging by pretense of selling odds and ends.

The experience of all countries has shown that mendicancy will thrive wherever indiscriminate almsgiving prevails. In modern society it may practically be stopped if steps are taken to care properly for the worthy poor and to compel others to work or else go hungry.

For an account of the general development of the care of the poor, see PAUPERISM. See also CHARITY ORGANIZATION SOCIETY; LABOR COLONIES; SOCIAL DEBTOR CLASSES; TRAMPS.

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MEN'DICANTS. See AUGUSTINIANS; CARMELITES; DOMINICANS; FRANCISCANS.

MENDOCINO, mĕn'dō-sē'nō, CAPE. See CAPE MENDOCINO.

MENDO'TA. A city in La Salle Co., Ill., 83 miles west of Chicago, on the Chicago, Burlington, and Quincy, the Chicago, Milwaukee, and St. Paul, and the Illinois Central railroads (Map: Illinois, F 2). It has a public library, Blackstone and Lincoln schools, and manufactories of machinery, agricultural implements, water-tank heaters, etc. The water works and sewage system are owned by the city. Pop., 1900, 3736; 1910, 3806.

MENDOTA, LAKE. One of the so-called "Four Lakes" (q.v.) of Wisconsin.

MENDOZA, mĕn-dō'sâ. A province of Argentina, comprising 16 departments, situated in the western part of the Republic and bounded on the north by the Province of San Juan, on the east by San Luís, on the south and southeast by the territories of La Pampa and Nequen, and on the west by Chile (Map: Argentina, F 5). Its area is estimated at 56,517 square miles. The western portion is occupied by the slope of the Andes Range, which rises on the boundary to a height of over 22,000 feet in Mount Aconcagua. Several lofty passes, including the famous and most frequented Uspallata, lead from the province into Chile. The eastern portion, from the foothills of the Andes to the border, is divided into two regions by the Río Diamante. That to the north is dry and arid, and that to the south consists of a well-watered grassy plain. The principal rivers are the Mendoza, Diamante, Tunuyán, and Atuel. The climate in the Andean region is cold, in the southeast temperate, and in the northeast hot. Owing to climatic conditions, irrigation is necessary in many parts of the province. The most important industry is vine culture and the production of wine, which is carried on chiefly in the Andean region. Agriculture and stock raising are carried on in the eastern section. Barley, fruits, hemp, wheat, corn, and lucern are the chief agricultural products. Cattle, hides, and wool are important exports. The extensive mineral deposits consist of coal, gold, silver, copper, and lead. There are, also, many mineral springs. The province has a national college, a normal school, and 286 primary schools. The Trans-Andean Railway crosses the northern part of the province. Pop., 1912, 247,848. Capital, Mendoza.

MENDOZA. The capital of the Province of Mendoza, Argentina, situated at the eastern base of the Andes, 647 miles west of Buenos Aires, on the Trans-Andean Railway (Map: Argentina, F 4). The town is well built and has beautiful drives and parks. It has a national college, an agricultural institute, normal

schools for both sexes, and a street railway. It is the chief centre of trade between Argentina and Chile. Pop., 1913 (est.), 60,000. Mendoza was founded in 1560. Here San Martín organized the army with which he won the independence of Chile. In 1861 a severe earthquake destroyed the city and killed 10,000 people. Consult V. Letelier, *Apuntes sobre el terremoto de Mendoza* (Santiago de Chile, 1907), and V. Blasco Ibáñez, *Argentina y sus Grandezas* (Madrid, 1910).

MENDOZA, mĕn-dō'thä, ANNA DE, PRINCESS OF EBOLI. See EBOLI.

MENDOZA, ANTONIO DE, COUNT OF TENDILLA (c.1485–1552). A Spanish administrator, born in Granada. He was a member of an illustrious family and became a great favorite with the Emperor Charles V. Constant quarrels in New Spain between the Governor, the nobility, and the Audiencia (the commission representing the Emperor) led to the determination to appoint in each territory a personal representative of the Emperor's authority, and Mendoza was appointed the first Viceroy of New Spain. He arrived there in 1535. With him he brought a printing press on which was printed the next year *La escala de San Juan Climoca,* the first book printed in Mexico. A mint was established the same year, schools and hospitals were built, and a college was founded. The breed of sheep was improved, silk culture was encouraged, and better methods of agriculture were introduced. An expedition under Vásquez de Coronado was sent to discover the mythical city of Cíbola and the no less mythical Quivira, and explored much of what is now New Mexico and Colorado. In 1542 a formidable insurrection of the Indians, called the Mixton War, was suppressed. Mendoza was not able to carry into effect the prohibition of further enslavement of the Indians, but succeeded better than might have been expected. In 1550 he was appointed Viceroy of Peru. He was an amiable but dignified and just man, a striking contrast to many of the Spanish rulers.

MENDOZA, DIEGO HURTADO DE (1503–75). A Spanish statesman and man of letters, born at Granada. Trained at Salamanca for the Church, he entered instead upon a military career and passed through the Italian campaigns of Charles V. The latter sent him as Ambassador to Venice (1539), whence he passed (1547) to Siena as the Imperial Governor. He had (1545) represented his Imperial master at the Council of Trent, and in 1549 he went to Rome to carry out Charles's policy of bullying the papacy. In 1554 he returned to Spain. As a poet, Mendoza has left compositions in the older conventional Spanish manner and some that show the influence of his classical attainments; he gained greatest repute in his own time, however, as one of the leaders in the movement which accomplished the Italianizing of Spanish lyric poetry. Mendoza's prose work of the most importance is his *Guerra de Granada,* dealing with an insurrection of the Moors. His acquaintance with Arabic equipped him admirably for the performance of this historical task, but his outspoken honesty prevented the appearance of a complete edition of the work until 1730, for the editions of Madrid (1610) and Lisbon (1627) are defective. Competent scholars no longer accept the attribution to him of the *Lazarillo de Tormes.* Morel-Fatio in a recent study points out some grave defects of style, even in the much praised *Guerra de Granada,* and questions the right of Mendoza to be considered the sole author thereof. Consult his verse in vol. xxxii of the *Biblioteca de autores españoles* (Madrid, 1854) and, in vol. xxi of that same collection (ib., 1852), an edition of the *Guerra de Granada;* J. D. Fesenmair, *D. Hurtado de Mendoza, ein spanischer Humanist des 16ten Jahrhunderts* (Munich, 1882); A. Señán y Alonso, *D. Diego Hurtado de Mendoza apuntes biográfico-críticos* (Granada, 1886); Foulché-Delbosc, in the *Revue Hispanique,* vols. i, ii (Paris, 1894–95); Alfred Morel-Fatio, "Quelques remarques sur La Guerre de Grenade de D. Diego Hurtado de Mendoza," in *Annuaire de l'Ecole des Hautes Etudes, 1914–15* (ib., 1914).

MENDOZA, IÑIGO LÓPEZ DE, MARQUÉS DE SANTILLANA. See SANTILLANA, IÑIGO, LÓPEZ DE MENDOZA, MARQUÉS DE.

MENDOZA, JUAN GONZÁLEZ DE (c.1540–1617). A Spanish prelate, born at Toledo. He joined the army, but after some years resigned to enter the Order of St. Augustine. In 1580 he was sent by Philip II to China, where he spent three years in gaining information as to the politics, commerce, and customs of the country. He spent two years in Mexico before returning to Spain. He was afterward Bishop of the Lipari Islands, of Chiapas, and of Popayán, where he died. He published an account of his observations in China in a work entitled *Historia de las cosas más notables, ritos y costumbres del gran reyno de la China* (1586). An English translation by R. Parke appeared in 1588 and was reprinted by the Hakluyt Society in two volumes, edited by Sir George T. Staunton, Bart. (London, 1853–54).

MENDOZA, PEDRO DE (c.1487–1537). A Spanish explorer. He was of a noble family high in the favor of the Emperor Charles V. In 1529 he offered to explore South America at his own expense and establish colonies. He was made military governor of all the territory between the Río de la Plata and the Strait of Magellan, and the Emperor gave 2000 ducats and advanced 2000 more on the condition that within two years Mendoza should transport 1000 colonists, build roads into the interior, and build three forts. He was to have half the treasure of the chiefs killed and nine-tenths of the ransom. The office of Governor was also made hereditary. In 1534 with a considerable fleet he set sail, but a terrible tempest scattered it off the coast of Brazil. Here his lieutenant, Osorio, was assassinated, according to some authorities by the orders of Mendoza himself because of suspected disloyalty. Mendoza sailed up the Río de la Plata and founded Buenos Aires in 1535. Pestilence broke out, and the natives became unfriendly. His brother Diego, who led a force against the hostile tribes, was killed with three-fourths of his men. A general conspiracy of the natives was formed, and the city was captured and burned. Another brother, Gonzalo, arrived with reënforcements and founded the city of Asunción in Paraguay in 1536. Mendoza, disappointed and broken in health, embarked for Spain, but died a maniac during the voyage, in 1537.

MEN'EDE'MUS (Lat., from Gk. Μενέδημος) (c.350–c.277 B.C.). A Greek philosopher, a native of Eretria. According to some authorities, he studied under Plato (to this statement chronological difficulties are opposed); according to

others, under Stilpo at Megara and under Phædo of Elis. He founded the Eretrian school of philosophy and was also one of the leading men in the political affairs of his state. If we may trust the testimony of the ancients, especially Cicero, the philosophy of Menedemus closely resembled that of the Megarian school. Consult Ritter-Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913).

MEN'ELA'US (Lat., from Gk. Μενέλαος). In ancient Greek legend, a king of Lacedæmon, the younger brother of Agamemnon and husband of the famous Helen. The abduction of his wife by Paris is represented as the cause of the Trojan War. In the *Iliad* he appears most prominently in the duel with Paris, when the life of the latter is saved only by the divine interposition of Aphrodite, and in the battle over the body of Patroclus, where he is one of the foremost combatants and eventually carries the corpse from the field. He entered Troy in the wooden horse (Vergil, *Æneid*, ii, 264). After the capture of Troy he slew Deiphobus, who had wedded Helen after the death of Paris, and in some versions intended to kill Helen also, but was disarmed by her beauty. After the fall of Troy he sailed with Helen for his own land; but his fleet was scattered by a storm, and he wandered for eight years about the coasts of Cyprus, Phœnicia, Egypt, and Libya. After his return he lived at Sparta with his wife, Helen, in great happiness; he was translated living to Elysium (*Odyssey*, iv, 561). Both Menelaus and Helen were worshiped as gods at Therapne, near Sparta, and it is probable that here, as so commonly in Grecian heroic myths, we have two local deities who have been reduced to hero and heroine. Consult the article "Menelaos," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MENELAUS. A Greek mathematician, who lived c.100 A.D. He wrote a book on the calculation of chords, not now extant, and a work in three books, under the title *Sphærica*. The latter, although not now extant in Greek, is known in Arabic and Hebrew, and in several Latin translations. It is a treatise on spherical triangles, with respect not to their solution, but to their geometric properties. One of the most interesting propositions is that concerning a spherical triangle cut by a transversal, the corresponding proposition for plane triangles being stated as a lemma. This theorem, known by the name of Menelaus, asserts that if the lines of the three sides of a triangle are cut by a transversal, the product of three segments which have no common extremity is equal to the product of the other three. For spherical triangles "the cords of three segments doubled" replaces "three segments." The proposition was often called in the Middle Ages the *regula sex quantitatum*. Menelaus also knew essentially the projective property of the unharmonic ratio of the segments determined by four collinear points.

MENELIK, mĕn'ĕ-lĭk (1844–1913). A king of Abyssinia, officially *negus negusti* (king of kings, or emperor). He was born in Ankobar, where his father, Ailu Malakoth, was Crown Prince of the Kingdom of Shoa. After his father's death in 1855 Menelik was for 10 years interned in Gojam by Theodore, Ailu Malakoth's rival, who attempted to make peace with him by giving him his daughter to wife. But in 1865 he escaped to Shoa, where he managed to establish himself, thanks to England's interference in Abyssinia, and as King (or *Ras*) of Shoa had little trouble in defeating the son of John, Ras of Tigré, in 1889 and in coming to the Abyssinian throne, to which he claimed a family right by a supposed descent from King Solomon (by the Queen of Sheba). He showed remarkable ability in bringing his army to a high pitch of efficiency. England's intervention between Italy and Abyssinia had already checked an open break, but when Italy claimed a protectorate by the Treaty of Uchali, Menelik protested in 1893, and in 1896 by the victory at Adowa forced Italy to sign the Peace of Addis Abeba, thus giving up all claim to a protectorate. He came to a complete understanding with Great Britain in 1898. In 1908 he announced that his grandson Lidj Jeassu, then a boy of about 12, would succeed him. In 1910, because of Menelik's ill health, a council of regency was formed. See ABYSSINIA.

MENÉNDEZ DE AVILÉS Y MÁRQUEZ, mȧ-nȧn'dȧth dȧ ä'vē-lās' ē mär'kȧth, PEDRO (1519–74). The founder of St. Augustine, Fla. He was born at Avilés in Asturias, Spain. Philip II placed him in command of the fleet which escorted the treasure vessels to and from the West Indies. Securing a grant of Florida with the title of Adelantado and Governor, he set sail, June 29, 1565, with 19 vessels carrying 1500 settlers, with orders to occupy the country and expel the French, who were making this their headquarters for privateering. On St. Augustine's Day, August 28, Menéndez discovered the harbor, on whose shores, on September 6, he began to build a fort, around which the present city of that name has grown up. Here the French Huguenots under Ribaut (q.v.) attacked him, but a hurricane drove them off, and before they could return to their settlement at Fort Caroline on the St. John's River, Menéndez attacked that post and massacred 142 of the garrison. The French fleet meanwhile had been wrecked, and the crews were forced to surrender to Menéndez, who put 180 of them to death. In 1567 Menéndez returned to Spain, and during his absence, in April, 1568, his colony was attacked by a French fleet under Dominique de Gourgues, who hanged a number of Spaniards. Meanwhile Menéndez had already started back, sailing from San Lucas on March 13 with supplies and reënforcements, with which he reëstablished St. Augustine. He had been appointed Governor of Cuba, and his efforts during the next few years were mainly devoted to that island and the gulf mainland. In 1570 he sent an expedition to the Chesapeake, which ascended the Potomac and built a chapel on the Rappahannock, where the party were killed by the Indians. In 1572 Menéndez revisited Florida and went on to the Chesapeake, where he captured several Indians supposed to have taken part in the massacre of his colony two years previously and hanged them. Philip II soon after this recalled him to Spain, where he died at Santander, Sept. 17, 1574. Consult Justin Winsor, *Narrative and Critical History of America*, vol. ii (New York, 1886), which contains also a critical essay on the sources of information.

MENÉNDEZ PIDAL, mȧ-nȧn'dȧth, JUAN (1861–1915). A Spanish archivist, jurisconsult, historian, and poet, brother of Luís and Ramón Menéndez Pidal. Born at Madrid, he studied law until he obtained his title, and then devoted himself to journalism. His *Dios y el César*, an ecclesiastical and legal study of the re-

lations of church and state, attracted much attention. He first published two legends: *El conde de Muñazán* (Burgos, 1880) and *D. Nuño de Rondaliegos;* the latter, by a tour de force, written in Old Castilian. His *Alla-lá* (1890) is a defense of Asturian literature from the general attacks on regional literature. Previous thereto he had published (Madrid, 1885) a much more important work, *Poesía popular: colección de los viejos romances que se cantan por los asturianos en la danza prima, esfoyazas, y filandones, recogidos directamente de boca del pueblo.* Other works of importance are: *San Pedro de Cardeña; D. Francesillo de Zúñiga; Las leyendas del último rey godo* (1906), a masterly study which exhausts the subject; *Poesías* (1913). Long a director of the Archivo Histórico Nacional at Madrid, and a director of the Revista de Archivos, Bibliotecas, y Museos, in 1914 he was elected a member of the Spanish Royal Academy of the Language.

MENÉNDEZ PIDAL, Luís (?1860–). A Spanish genre painter, brother of Juan and Ramón Menéndez Pidal. Born at Oviedo, he studied in the School of Bellas Artes at Madrid and took part in the National Exposition held there in 1887. In the exposition of 1890 he won a second-class medal for "A buen juez mejor testigo," and another picture attracted the attention of the Queen Regent, who bought it. In 1892 his "La cuna vacía," when published in *El Liberal,* obtained the first-class medal without a dissenting vote. His "Salus infirmorum," hung in the General Exposition of Bellas Artes at Madrid in 1899, won a first medal. His style is eminently personal, and he is considered one of Spain's best colorists. He chooses by preference country scenes and those of family life, especially such as show the family affections; but he is also a good portraitist. In 1906 he was elected a member of the Royal Academy of Bellas Artes de San Fernando.

MENÉNDEZ PIDAL, María Goyri de (1873–). A Spanish Hispanist, wife of Ramón Menéndez Pidal. Born in Madrid, she began her studies there in the normal and business courses of the Association for the Education of Women. Later, despite the difficulties due to the unusualness of the proceeding, she studied philosophy and letters in the University of Madrid, obtaining the titles of normal school professor (1893), licentiate in philosophy and letters (1896), and doctor of philosophy and letters (1909). Among her publications are the following: "Romance de la muerte del Príncipe D. Juan," in the *Bulletin Hispanique,* vol. iv (1902); "Romances que deben buscarse en la tradición oral," in *Revista de Archivos, Bibliotecas, y Museos* (1907); various articles on "El Conde Lucano," in *Revue Hispanique* (1899); *Romania* (1900), and *Revista de Archivos, etc.* (1902); "La difunta pleiteada en la literatura española: estudio de literatura comparada," in *Revista de Archivos* (1909).

MENÉNDEZ PIDAL, Ramón (1869–). A Spanish philologist, born at Coruña, March 13, 1869. He studied at the universities of Madrid (under Marcelino Menéndez y Pelayo, q.v.) and of Toulouse and after 1899 held the chair of Romanic philology at Madrid. In addition he lectured in Spain, South America, and the United States. At Johns Hopkins he delivered the Turnbull lectures in 1909, published the next year as *L'Epopée castillane à travers la littérature espagnole;* and his Hispanic Society lectures at Columbia (1909) appeared as *El romancero español.* His interest in education led to his being made a member of the board created in 1907 for the advancement of university work in Spain (the Junta para Ampliación de Estudios), director of the summer session of the board, and (1913) Counselor of Public Instruction for the Kingdom. His varied public service included a journey to Quito and Lima in 1904–05 as Royal Commissioner to investigate the claims in the Peru-Ecuador boundary dispute. Menéndez Pidal is to be compared with Friedrich Diez and Gaston Paris (qq.v.). His services were recognized by membership in the Spanish Royal Academy of the Language, the Royal Academy of History, Madrid, and the Hispanic Society of America, among other learned bodies at home and abroad. From 1906 to 1909 he was editor of the philological section of *Cultura Española,* and later he undertook the editorship of the *Revista de Filología.* His *Gramática y vocabulario de poema del Cid* and *Leyenda de los infantes de Lara* were awarded prizes by the Spanish Royal Academy of the Language and the Royal Academy of History, respectively, in 1895 and 1897. His *Gramática histórica española* (2d ed., 1905) is his most important work. Other writings include: *Leyenda del Abad Don Juan de Montemayor* (vol. ii, *Gesellschaft für romanische Literatur,* 1903); *Primera crónica general* (vol. v, *Nueva biblioteca de autores españoles,* 1906); *Cantar de mio Cid* (3 vols., 1908–11); *Cancionero de romances impreso en Amberes sin año* (1914). A critical bibliography entitled *Obras de D. Ramón Menéndez Pidal* (Madrid, 1912) fills 35 pages and is complete to the time of its appearance.

MENÉNDEZ Y PELAYO, pā-lā'yō, Marcelino (1856–1912). A Spanish historian of philosophy and letters. He was born at Santander, Nov. 3, 1856, and studied at the universities of Barcelona (where he was a pupil of Manuel Milá y Fontanals, q.v.) and Madrid. At Madrid he was appointed professor of philosophy and letters when 22, and at 25 he was admitted to the Spanish Royal Academy of the Language (which, strangely, never made him president). His precocity developed into a ripe scholarship, so that he came to be regarded as one of the greatest humanists of the nineteenth century. After 20 years of teaching he accepted the directorship of the National Library, keeping in touch with academic life by lecturing frequently at the Madrid Athenæum. Menéndez y Pelayo was famous for his insatiable appetite for books and his wonderful memory. He appeared to read everything and to make all that he read a part of his mental acquisition. This, however, will not account entirely for the quantity and nature of his published work. Of his nationality and the fact that he was a Catholic he was equally proud; his patriotism and religious fervor together made him a tireless defender of traditional Spain. As a critic, he held himself at the service of any student or scholar who needed his services. Nor was he destructive in his criticism—he first pointed out defects that he found in a work and then went on to search for and generously to recognize all its good qualities. Among his pupils who afterward became distinguished were Ramón Menéndez Pidal and Adolfo Bonilla y San Martín (qq.v.). As a writer of both prose and verse, Menéndez y Pelayo exercised a most wholesome influence on

the younger generation by the quality of high seriousness always present in his work. He was appointed dean of the Faculty of Letters at Madrid University, chief of the Board of Archivists, and Counselor of Public Instruction; was elected Deputy in the Cortes and Senator; became a member of the academies of Moral and Political Sciences, Fine Arts (San Fernando), and History (librarian and director), besides being honored by societies at Lisbon, Barcelona, and Seville and receiving the grand cross of the Order of Alfonso XII. He died May 19, 1912, at Santander.

The literary activity of Menéndez y Pelayo, beginning with various studies that won prizes in the literary tournaments at which they were presented, finally placed him at the head of Spanish critics of literature and philosophy. His two greatest works are his critical histories of philosophy, entitled *Historia de los heterodoxes españoles* (3 vols., 1880–82) and *Historia de las ideas estéticas en España* (1883–91). His editorial work includes: *Antología de poetas líricos castellanos* (13 vols., 1890–1908); *Obras de Lope de Vega* (15 vols., 1890–1902); *Antología de poetas hispano-americanos* (4 vols., 1893–95). In the same field as the last named he published *Historia de la poesía hispano-americano* (1911). *Horacio en España* (1885) and *Bibliografía hispano-latina* (1902) are representative of his classical researches. Poetical, dramatic, and miscellaneous writings, both originals and translations, appeared as *Odas, epístolas, y tragedias* (1883; 2d ed., 1906).

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MENEP'TAH, or **MERNEPTAH** (Egypt. *Meri-en-Ptah*, Beloved of Ptah; Lat. *Amenephthes;* Gk. *'Αμμενεφθίς, Ammenephthis*). A king of Egypt, the son and successor of Ramses II (q.v.). He reigned for some 20 years about the middle of the thirteenth century B.C. and, in the fifth year of his reign, repelled a formidable invasion of Libyans and pirates. He built largely at Tanis and left monuments in various parts of Egypt. Formerly there seemed to be good grounds for identifying this King with the Pharaoh of the Exodus, but an inscription, discovered in 1896, mentions Israel as settled in Palestine in the fifth year of Meneptah's reign, and the identification is therefore impossible. The text of this interesting inscription, which contains the only mention of Israel to be found on the Egyptian monuments, was published with a German translation by Spiegelberg, in the *Zeitschrift für ägyptische Sprache*, vol. xxxiv (Leipzig, 1896), under the title "Der Siegeshymnus des Merneptah auf der Flinders Petrie Stele." The mummy of Meneptah was found at Thebes in 1898, and is now in the Museum of Cairo. Consult E. A. T. W. Budge, *A History of Egypt* (New York, 1902), and J. H. Breasted, *A History of Egypt* (2d ed., ib., 1909). See also EGYPT.

MENES, mē'nēz (Egypt. *Meni;* Gk. *Μήν, Mēn, Μήνης, Mēnēs*). A king of Egypt whom the Egyptians regarded as their first historical monarch. His name invariably stands at the head of all monumental lists of Egyptian kings, but little is known in regard to him. According to Manetho he was a native of This, and reigned for 62 years. Herodotus and other Greek writers attribute to him the foundation of Memphis and relate many other fables concerning him. But the list of Saqqara begins with the sixth king of the first dynasty. This may invalidate Menes's claim as founder of Memphis. In modern times certain scholars have believed that he was the Pharaoh who united Upper and Lower Egypt under a single monarchy, but recent discoveries indicate that the union took place at an earlier date. At present there is a tendency to identify Menes with an early king of whom many small memorials have been found near This. Two large tombs—one at Naggadah, near Coptos, the other near Abydos—are filled with objects bearing the name of this King. The reading of the name is, however, not altogether certain, and the proposed identification is therefore doubtful. Consult: *Sitzungsberichte der Berliner Akademie der Wissenschaften* (Berlin, 1897); *Revue Critique* (Paris, 1897); *Zeitschrift für ägyptische Sprache*, vol. xxxvi (Leipzig, 1898); E. A. T. W. Budge, *A History of Egypt* (New York, 1902); J. H. Breasted, *A History of the Ancient Egyptians* (ib., 1908).

MENEVILLE, FÉLIX EDOUARD GUÉRIN-. See GUÉRIN-MENEVILLE, F. E.

MENFI, mĕn'fē. A town in the Province of Girgenti, Sicily, 30 miles south by east of Marsala. It exports corn, wheat, barley, cotton, oil, and wine. The quarries of the vicinity are supposed to have furnished the building material for the temples of ancient Selinus. Pop. (commune), 1901, 10,281; 1911, 11,189.

MENGELBERG, mĕng'el-bĕrg, WILLEM (1871–). A Dutch orchestral conductor, born in Utrecht. He received his first musical education in his native town and then entered the Cologne Conservatory, where Wüllner, Seiss, and Jensen were his teachers. In 1891 he began his career as municipal music director at Lucerne. In 1895 he went to Amsterdam as conductor of the Concertgebouw Orchestra, which under his energetic leadership soon became one of the finest orchestras in Europe. During the season 1905–06 he was one of the guest conductors of the New York Philharmonic Society. In 1907 he was called to assume the leadership of the Museumskonzerte in Frankfort. Extensive tours took him through all European countries. As an interpreter of the works of Richard Strauss he became especially distinguished.

MENG'ER, KARL (1840–). An Austrian economist, born at Neu-Sandez in Galicia. He studied law and political science in Vienna and Prague, and after 1872 was identified with the University of Vienna, in 1879 becoming full professor of political economy. In 1900 he was made a life member of the Austrian House of Peers. The leader of a reaction against the historical method in economics, he became one of the most prominent leaders of the so-called Austrian school of political economy. His most important work, from a theoretical standpoint, is

Grundsätze der Volkswirtschaftslehre (1871). Other important works are: *Untersuchungen über die Methode der Sozialwissenschaften und der politischen Oekonomie insbesondere* (1883); *Die Irrtümer des Historismus in der deutschen Nationalökonomie* (1884); *Beiträge zur Währungsfrage in Oesterreich-Ungarn* (1892). His article "Geld" in the *Handwörterbuch der Staatswissenschaften* (3d ed., 1909) is regarded by competent authorities as the best brief exposition of the money question in existence.

MENGS, mĕngs, ANTON RAPHAEL (1728–79). A German historical and portrait painter. He was born at Aussig, Bohemia, March 12, 1728, the son of Ismael Mengs, a miniature painter of some repute, who in 1741 took him to Rome. On his return to Dresden in 1744 he was appointed court painter by the Elector Augustus III, who permitted him to continue his studies at Rome. There he painted the first of his large compositions, a "Holy Family," now in the Gallery of Vienna, and of additional interest because the model for the Madonna was Marguerita Guazzi, a beautiful peasant girl whom he married, and for whose sake he embraced Roman Catholicism. The financial distress occasioned by the Seven Years' War caused his pension to be stopped, but he received numerous commissions from the art patrons of all nationalities, among others the Duke of Northumberland, who employed him to paint a copy of Raphael's "School of Athens." In 1754 he was made director of the new Art Academy on the Capitol; in 1757 he painted the ceiling in San Eusebio, and soon afterward the celebrated "Mount Parnassus" in the Villa Albani. In Rome also he became the intimate friend of the great art critic Winckelmann.

On a visit to Naples he attracted the attention of the King, who, on his accession to the throne of Spain as Charles III, invited Mengs to Madrid. During this first sojourn at Madrid (1761–69) he executed several frescoes in the Royal Palace, of which "Aurora and the Four Seasons" is the best. Intrigues against him and feeble health caused his return to Italy, but he was summoned back to Madrid in 1774 to complete his work in the Royal Palace. He painted there the "Apotheosis of Trajan," his most important fresco, and the "Temple of Fame." In 1777 he returned to Rome, where he died, June 29, 1779.

His fresco paintings are superior to his canvases. Good examples of the latter are a "Nativity" in Madrid, an "Annunciation" in the Vienna Gallery, and the "Ascension" in Dresden. The Dresden Gallery contains a number of his pastels, including portraits of himself and his father. Mengs was an eclectic who endeavored to blend the beauty of antique art with that of the great Italian masters. Living at a time of extreme degradation in art, he commanded great admiration by his skill in composition and his thorough knowledge of technical processes, but his color was cold and lacked the fire of genius. He exercised a profound influence upon his contemporaries by his writings on eclectic art, as well as by his paintings, and trained numerous pupils. Consult Woermann, *Ismael und Raphael Mengs* (Leipzig, 1893).

MÊNG-TSE, mŭng-tsĕ′. See MENCIUS.

MENGTSZE, mĕng′tsĕ′. A town in the Province of Yunnan, China, situated amid mountains at an elevation of about 4600 feet, about 40 miles from the frontier of Tongking (Map: China, H 7). It is a well-built city with traces of its splendor and importance before the Taiping Rebellion. It was opened to foreign commerce in 1889 in accordance with the French Treaty of Tientsin of 1886. The trade is mostly transit and with Hongkong. The merchandise is transported by the Red River as far as Manhas, a village on the left side of the river about 40 miles from Mengtsze, and from there is carried by coolies and pack animals inland. The chief exports are tin from the adjacent mines and opium; textiles and tobacco are imported. Mengtsze is connected by telegraph lines with Yunnanfu and the frontier of Tongking. The French government has obtained a concession for the construction of a railway line from Laokai on the frontier to Yunnanfu via Mengtsze. Pop., 1912, est., 11,000. In 1912 net foreign imports amounted to 7,721,840 taels and exports to 11,847,849 taels, a total trade for the year of 19,569,689 taels (in 1912 a tael was equal to 74 cents United States gold).

MENHADEN, mĕn-hā′den (corrupted from Narragansett Indian *munnawhatteaûg,* fertilizer, in allusion to its use as a fertilizer in the cornfields). A small fish (*Brevoortia tyrannus*), closely related to the shad (q.v.), which is caught in great quantities on the eastern coast of North America during the summer months. Its length varies from 12 to 18 inches; the color of the upper parts is greenish brown, with a black spot on the shoulder, the belly silvery, and the whole surface iridescent. The flesh is not highly esteemed as food and is very full of small bones; but it is rich in oil and nitrogen.

Economic Uses. The menhaden is one of the most interesting and valuable of American sea fishes, and its catching and utilization give occupation to a large amount of capital and number of men and vessels. (See FISHERIES.) It is extremely irregular in its movements and numbers, migrating into deep water or to warm latitudes on the approach of cold weather and reappearing north of Cape Hatteras with advancing warm weather. In some years it has been extremely numerous as far north as Nova Scotia; while there have been periods when the fish seemed to have forsaken America altogether. It appears alongshore in schools, which may contain a million or two of fishes, swimming near the surface. With ordinary care such a school may be surrounded by a net, operated from two rowboats, and then hauled to the ship's side, where the net is pursed and the fish are dipped out and thrown into the hold. A catch of half a million is not unusual. Formerly small sailing vessels were altogether used, but since about 1875 high-powered, tuglike steamers have mostly replaced them. All along the shore from the Carolinas to eastern Maine are factories where these loads of menhaden are sold. Their bodies yield oil of a superior sort, useful for every purpose to which any fish or whale oil may be applied. This is obtained by boiling and pressing. (See OIL.) From the residue is made a nutritious animal food called fish meal, and a highly nitrogenous ingredient of artificial guanos. In early times, following the example of the Indians, the fish themselves used to be spread upon the farms near shore and plowed into the soil; but it was found that, apart from the extremely disagreeable taint this gave to the air of the whole region, the soil was injured by saturation with oil.

Great quantities of menhaden are also used as bait in the Banks fisheries; are sold fresh in the markets, very cheaply; and are salted for do-

mestic use or to be exported to the West Indies; and the young are extensively canned in oil as "American sardines" and "shadines." The fish has, however, a still higher economic value in serving as the food of other fishes important to us. It itself subsists mainly upon minute vegetable material contained in the mud of bays and soft shores, and is enormously fecund. Every predacious animal in the sea eats menhaden. Goode estimated that the total number of menhaden devoured by fishes annually could only be counted by millions of millions, and he declared that were the menhaden to disappear three-fourths of the value of the American fisheries would instantly vanish.

FISH LOUSE OF THE MENHADEN.

A degraded entomostracan parasite (*Lerneonema radiata*); the "rooted" head is at the right.

The menhaden is known by an extraordinary number of different names: as pogy in Maine; bony fish in eastern Connecticut; whitefish in western Long Island Sound; bunker, a shortening of mossbunker (q.v.), about New York and New Jersey; bugfish or bughead in Delaware and Chesapeake bays, referring to a parasitic crustacean (see PARASITE, ANIMAL) in the mouths of the southern menhaden; and farther south as fatback, yellowtail, and savega—the last the Portuguese term in South America. The menhaden of the Gulf of Mexico is a variety locally called alewife, herring, etc.; and other varieties extend the range of the species to Brazil.

Consult: G. B. Goode, "The Menhaden," an elaborate memoir, in *Report of the United States Fish Commission*, part v (Washington, 1877), and a more condensed account in *Fishing Industries*, sec. i (ib., 1884); W. E. Hathaway, *Effects of Menhaden Fishing upon the Supply of Menhaden and of the Fishes that Prey upon them* (ib., 1910). For a picturesque account of catching menhaden, see "Around the Peconics," in *Harper's Magazine*, vol. lvii (New York, 1881). See FISHERIES; Plate of HERRING AND SHAD.

MENHIR. See CARNAC; MEGALITHIC MONUMENTS.

MÉNIÈRE'S (mā'nyârz') **DISEASE.** A condition marked by sudden and complete loss of hearing and attended with nausea, vomiting, tinnitus, twitching movements of the eyeball (nystagmus), and vertigo. There is as a rule no previous history of ear disease, the tympanic membrane and other auditory tissues being normal in appearance. The condition is thought to be due to hemorrhage into the labyrinth (q.v.). The acute symptoms disappear as a rule within a few days or weeks, but the deafness remains permanent. Unsteadiness of gait and tremulous handwriting persist in some patients for a long time. Treatment has little influence on the disease, but some improvement may be expected from sweats induced by pilocarpine; and iodide of potash given for long periods is supposed to promote absorption of the blood clot.

Ménière's "symptom complex" is a condition similar to the above except that the attacks do not come so suddenly, are apt to be repeated, and there generally exists previous ear disease. The symptoms may be brought on by obstructive lesions in the Eustachian tube or middle ear with a consequent rise of pressure in the labyrinthine fluids. See EAR.

MENILIK. See MENELIK.

MENIN, *me-năn'*. A frontier town of West Flanders, Belgium, situated 30 miles southwest of Ghent, on the left bank of the Lys, which here forms the French boundary (Map: Belgium, B 4). It has a handsome church, a bishop's college, manufactures of lace and cotton textiles, tobacco, and a famous old brewery. There are salt baths near by. Menin was taken by the Germans in their envelopment of Belgium during the European War which began in 1914. It was recaptured by the British expeditionary force. The latter were forced to evacuate the town, which they later damaged by an aërial attack. See WAR IN EUROPE. Pop., 1900, 18,611; 1910, 18,636.

MENIN. The ancient name of the island of Terba.

MEN'INGI'TIS. An inflammation of the meninges, the membranes covering the brain and spinal cord. These are three in number: the *pia mater*, lying in contact with the substance of the brain and cord; the *dura mater*, lining the cranial cavity and spinal canal; and the *arachnoid*, a delicate weblike structure lying between the *pia* and *dura*. The term "meningitis" is specifically applied to an inflammation of the pia mater of the brain, described in this article under the heading of *Cerebral Meningitis*. Inflammation of the dura, whether of the brain or cord, is called *pachymeningitis*, and of the pia, *leptomeningitis*. The term "arachnitis" was formerly used on the supposition that the arachnoid might be the seat of an independent inflammatory process, but this is no longer believed to be possible. An inflammation involving the meninges of both the brain and cord is termed *cerebro-spinal meningitis*. For convenience of description the subject may be arranged under the following heads: pachymeningitis, involving the dura of the brain and cord; cerebral meningitis, of which two forms are recognized, tubercular and simple; spinal meningitis; and epidemic cerebro-spinal meningitis.

Pachymeningitis. This disease occurs in the external or internal form. Inflammation of the outer surface of the dura mater is uncommon and occurs nearly always by extension from neighboring disease. Either the cerebral or the spinal dura may be attacked. The cerebral form occurs as a consequence of blows and injuries of the skull, erysipelas of the scalp, or tumors of the cranium. A localized external pachymeningitis may arise from inflammation of the mastoid cells or middle or internal ear. The spinal form of pachymeningitis may be either widespread or localized; it also is due to extension from diseased adjacent structures, such as tuberculosis of the spine. Gowers describes a primary form in young, ill-nourished adults, the exciting cause being usually exposure to cold. The symptoms of pachymeningitis externa vary according to the nature and extent of the process. In acute cases severe pain, headache and a rise of temperature, hyperæsthesia, muscular spasms, and stiffness of the neck are seen. The treatment is that of the primary disease. Pachymeningitis interna occurs as a rare result of extension of purulent inflammation from the leptomeninges; as a pseudomembranous inflammation during pneumonia (Osler); in a hemorrhagic form; and in a chronic hypertrophic form. The hemorrhagic form is a rare condition and is also known as hæmatoma of the dura mater. In this disease the internal surface of the dura is the seat of a peculiar hemorrhagic inflammation, characterized by the formation of adventitious membranes, which appear to be repetitions of the arachnoid, having blood ves-

sels which rupture, the extravasated blood collecting in the form of cysts containing from an ounce to a pound of blood. The symptoms are primarily those of inflammation and secondarily due to pressure. There are some fever, irregularity of the pulse, headache, giddiness, somnolence, gradually deepening to coma; and there may be twitching and convulsions, followed by muscular weakness and paralysis. The disease affects the dura of both brain and cord, but the symptoms referable to the latter are often overshadowed by the cerebral effects. The diagnosis is difficult and the termination almost invariably fatal. The chronic hypertrophic form of internal pachymeningitis occurs in the spinal dura, producing an extensive thickening of the membrane. This in turn causes severe compression of the cord and spinal nerve roots. After a first stage of shooting pains along the course of the nerves affected, with muscular twitchings and spasms, there gradually supervene anæsthesia, paralysis, and atrophy. As the compression increases, paraplegia, secondary degeneration, and rigidity of the paralyzed parts appear. This form of pachymeningitis is due to syphilis, alcoholism, or injury, and is thought by some writers to follow the hemorrhagic form. Treatment consists of counterirritation over the spine, with remedies for the pain and spasms. When the trouble is syphilitic great improvement may be derived from mercurials and potassium iodide or from salvarsan.

Cerebral Meningitis. Acute inflammation of the pia mater of the brain occurs chiefly in two forms—tubercular and simple or purulent. The arachnoid takes part, to a greater or less extent, in the inflammatory process.

Tubercular meningitis occurs at all ages, but is more common in children than in adults. The disease is caused by the *bacillus tuberculosis* and is usually secondary to a tuberculous process in some other portion of the body, e.g., pulmonary phthisis, hip-joint disease, or caries of the spine. The characteristic lesions of the disease are found in the pia mater at the base of the brain or over the optic chiasm, crura, or pons. Tubercles are deposited along the vessels of the pia, which becomes thickened, opaque, and studded with grayish-white granules. There is an exudation of lymph, gray or grayish yellow, but rarely purulent, into the meshes of the membrane in the same portions in which the tubercles exist and extending along the fissure of Sylvius and the middle cerebral artery. The upper surface of the hemispheres is only slightly affected, so that the disease is sometimes called basilar meningitis. The ventricles are generally distended with fluid (whence the old name, acute hydrocephalus), clear, milky, or even bloody. The onset of the disease is often preceded by a period of general ill health. The child is peevish, irritable, with constipation and loss of appetite. The first or irritative stage then sets in suddenly, with a convulsion, or more commonly with vomiting, headache, and fever. The headache is severe and continuous, and the child moans and occasionally utters a sharp cry—the so-called hydrocephalic cry. Sometimes the patient screams until utterly exhausted and has to be kept under the influence of powerful sedatives all the time. There are moderate fever and excessive sensitiveness to light and sound. In the second period of the disease, the stage of depression, the irritative symptoms subside. The child no longer complains of headache, but is dull and apathetic, drowsy, or slightly delirious. Pulse and respiration are irregular and fever continues. The head is retracted and the neck stiff. If the finger nail is drawn across the skin of the forehead or abdomen a broad red streak appears, the *tache cérébrale,* which may last for five minutes. In the last or paralytic stage all these symptoms are intensified; the drowsiness increases to coma; paralysis of various parts of the body occurs, and death takes place in from 10 days to three weeks after the onset of pronounced symptoms. Few cases recover. Treatment is entirely symptomatic and palliative. An ice cap is put upon the head, and sedatives are given internally.

Simple acute meningitis is as a rule purulent or suppurative. It may be caused by inflammation of neighboring tissues, e.g., otitis, suppurative phlebitis, or abscess of the brain; or may occur as a complication of pyæmia, septicæmia, malignant endocarditis, or the specific fevers, particularly smallpox, typhoid, and scarlatina. The pia mater and arachnoid become infiltrated with purulent material and the brain beneath them is inflamed. The symptoms resemble in a general way those of the tubercular form just described, but the onset and course of the malady are much more rapid. When simple meningitis occurs in the course of other acute illnesses its features may be masked to a certain extent, but in other cases the symptoms begin acutely with a high temperature, chill, severe pain in the head, and vomiting, and the case passes on to convulsions, paralysis, coma, and death. A fatal termination is the rule, but some recoveries occur after a long period of convalescence.

Quincke has described a serous form of meningitis occurring in acute infectious diseases or intoxications or arising spontaneously. It may precede acute purulent otitis media, also, but no microörganisms are found. Lumbar puncture shows that the cerebrospinal fluid is increased in amount and under great pressure, and this procedure may ameliorate or cure the condition if it is not a mere precursor of purulent meningitis.

Spinal Meningitis. The membranes of the spinal cord may be affected separately, but it is common for inflammation to spread from one to the others. Inflammation of the dura, pachymeningitis, has already been described. Acute leptomeningitis, or acute spinal meningitis, as it is called, involving the pia, is often of obscure origin, but is known to be due to exposure to cold, sunstroke, and injuries to the spine; and it sometimes complicates pneumonia, scarlatina, typhoid fever, and septicæmia. Not infrequently a tubercular inflammation accompanies a like process in the cerebral pia mater. The attack begins with the usual symptoms of meningeal inflammation, viz., vomiting, chill, fever, and pain. The pain is in the back; it may be local or general, and it is increased by movement or pressure. There are also shooting paroxysmal pains, radiating along the course of the nerves arising in the affected area, and extreme sensitiveness of the skin and muscles to which those nerves are distributed. Irritation of the anterior nerve roots leads to spasms of the muscles, producing rigidity of the spine with sometimes extreme arching (opisthotonos). In addition there is the usual accompaniment of fever. After a few days the symptoms of irritation give way to paralysis and insensibility, and the disease either proves fatal from exhaustion and failure of the respiratory muscles or lapses into a chronic condition with wasting and shortening of the mus-

cles. Some patients recover after several months, while others ultimately die from bed sores, or from renal or vesical complications. In this form of meningitis the pia mater is reddened and congested and small hemorrhages may occur. An exudation, at first grayish in color, but later purulent and yellow or greenish yellow, takes place into the meshes or upon the surface of the pia, and the spinal fluid is rendered turbid and opaque. The inflammatory process may extend to the substance of the spinal cord (causing myelitis), or to the inner surface of the dura mater, involving of course the arachnoid and gluing the three membranes together. Treatment comprises rest in bed, upon the side or face, active purgation, and cups or leeches along the spine, followed by the application of ice. Internally drugs are given to relieve pain and diminish sensibility. In the chronic stage counterirritants are applied along the spine, and mercurials or iodides are administered. During convalescence tonics, massage, cold douches, and the electric current are of great service.

Chronic leptomeningitis may be a continuation of the acute form or it may be chronic from the beginning, and has been attributed to cold and exposure, syphilis, chronic alcoholism, and injury. It often occurs in connection with degenerative processes of the cord itself. The condition is one of gradual thickening of the pia mater with compression and atrophy of the nerve roots. The symptoms are the same as in the acute form, with the difference that they come on gradually and there is no fever. Muscular spasm and rigidity are less marked.

Epidemic Cerebro-Spinal Meningitis has been known only since the beginning of the nineteenth century, being first recognized in Geneva, Switzerland. It made its first appearance in America in Massachusetts in 1802. Many severe epidemics have since occurred both in Europe and America. The disease visited Ireland in a very fatal form in 1846 and again in 1866–68. It is a specific infectious disease due to a micro-organism, the *diplococcus intracellularis* of Weichselbaum. The diplococcus has been found in the secretions of the nose, eye, bronchial tubes, joints, and in the blood. Infection is believed to spread through contact with mucous secretions of the upper respiratory tract. Epidemics occur most frequently in winter and spring, and the disease has assumed its most fatal type during times of famine and among squalid tenement dwellers or soldiers in crowded barracks. The changes observed in the meninges are those characteristic of a widespread and severe leptomeningitis. The pia mater is intensely congested and its blood vessels dilated. Pus and lymph are abundant on the convex surface of the brain, along the large blood vessels, and in the fissures. The ventricles contain turbid serum or pus. Small hemorrhages and sometimes abscesses are found in the cortex of the brain. There is in addition congestion of the lungs, liver, spleen, and kidneys. Several clinical varieties of the affection have been noted and the course and symptoms vary remarkably in the different types. In the malignant or fulminant type the disease may prove fatal in a few hours. The abortive type presents only a few symptoms and is characterized by rapid recovery. Remittent and intermittent forms are recognized in which the fever is lower or entirely absent for two or three days, and there is a form that much resembles typhoid fever. The average duration of the disease is three or four weeks, and the mortality from 30 to 70 per cent in the different epidemics. As might be expected from the extent of tissue involved, the symptoms are very numerous and diverse. No single set of symptoms occurs in all cases. In some there is an indefinite premonitory stage, with malaise, nausea, and headache; but usually the onset is sudden, with a chill, severe headache, vomiting, pains in the back and limbs, and fever. With these manifestations comes stiffness of the muscles of the neck and back, so that the head is retracted and the back arched. Inability to extend the legs fully when the thigh is bent at right angles to the trunk (Kernig's sign) is an important diagnostic phenomenon. There are also pains in the lower extremities and hyperæsthesia of the skin. In addition to these symptoms due to irritation of the spinal nerve roots there are others referable to implication of the cranial nerves. These are, in different cases, drooping of the eyelids (ptosis), squint, contraction, dilatation, or inequality of the pupils, or spasms of the facial muscles. The temperature runs a very irregular course. An important feature of the disease is the occurrence in many cases of a herpetic eruption or petechial or purpuric spots, whence the names spotted fever and petechial fever. Recovery is apt to be marked by the occurrence of many disagreeable sequels. Deafness is common and sight is often impaired. Chronic hydrocephalus with headache, muscular weakness, and mental deficiency occurs in a few instances. Lumbar puncture may relieve headache and delirium and is useful as a diagnostic procedure and as a preliminary to the introduction of Flexner's serum or urotropin. The serum may also be injected directly into the lateral ventricles of the brain when, as frequently happens in meningitis, communication between the cerebral and spinal centres is shut off. Great reduction in mortality is claimed from serum treatment. Consult: Koplik, *Diseases of Infancy and Childhood* (Philadelphia, 1910); an article by the same author on epidemic cerebrospinal meningitis in Osler's *Modern Medicine* (New York, 1914); Flexner, "Results of Serum Treatment in 1300 Cases of Epidemic Meningitis," in *Journal of Experimental Medicine* (New York, May, 1913).

Cerebro-Spinal Meningitis, Blind Staggers, Forage Poisoning, Borna Disease. A disease of horses characterized by inflammation of the membranes of the brain and spinal cord and the adjacent nerve tissue. It has been considered by some authors to be infectious, owing to an occasional epizoötic-like outbreak. Others consider toxic fungi on forage to be the cause. Recent investigations have failed to determine the specific cause and it still remains an obscure and puzzling problem.

Occurrence.—The disease has occurred throughout Europe and outbreaks from time to time become widespread in the United States causing heavy loss, as was the case in the Kansas and Nebraska outbreak of 1913, while at other times there are only sporadic cases.

Symptoms.—Disturbance of the appetite, depression, and weakness are in most cases the first manifestations observed. The characteristic symptoms of the disease soon disappear. There are difficult swallowing, drooping of the head, and sleepiness which may give way to excitement and attacks of vertigo. Impairment of vision is noted, with loss of coördination, resulting in a staggering gait or reeling while standing. There are muscular twitching, cramp of certain muscles,

chiefly of the neck and flanks, and grinding of the teeth. Sometimes colicky pains are noted. If in an open space, the animal will walk in a circle, sometimes to the right, at other times to the left, and will try to push through any obstacle with which he comes in contact. If the temperature is taken at the beginning of the disease it will be found to be from 103° to 107° F., but within 24 hours the temperature gradually falls until it reaches normal and then becomes subnormal. The animal is often down on the second or third day and may or may not get up when urged to do so. Coma or somnolence may be marked in animals going down within the first few days. Those which remain standing may become violent or delirious, but ordinarily the horse is tractable and easily managed. Death usually occurs in from four to eight days, although in the acute form death may follow within 10 or 12 hours after the first symptoms are observed, while in chronic cases the disease may last two or three weeks. The prognosis is very unfavorable, as 85 to 90 per cent of the affected animals die in the beginning of the outbreak, but later the cases become milder, with a consequent drop in the mortality. There are no constant post-mortem lesions in the vital organs, the most important alterations being found in the membranes of the brain.

Treatment.—It appears to be the consensus of opinion of practically all investigators that the disease can be controlled effectively only by a total change of feed and forage; i.e., by preventive measures and not by medicinal treatment. That there is direct connection between ingestion of green forage, exposed pasturage, newly cut hay and fodder, and the development of the disease is quite obvious, and that the ingestion of such forage when contaminated is the most important factor is equally obvious, since almost 100 per cent of the cases in Kansas and over 95 per cent of the cases in Nebraska of which there is any record were maintained all or part of the time under such conditions. Medicinal treatment has proved unsatisfactory in the vast majority of cases. However, the digestive tract should be thoroughly cleaned out through the use of active and concentrated remedies given subcutaneously or intravenously. Arecolin given subcutaneously in half-grain doses has given as much satisfaction as any other drug. After purging the treatment is mostly symptomatic. The horse owner should beware of all kinds of drug specifics, serums, and vaccines unless recommended by a reliable veterinarian.

Consult R. W. Hickman, *Epizoötic Cerebro-Spinal Meningitis of Horses* (Washington, 1906), and J. R. Mohler, *Cerebrospinal Meningitis* (ib., 1914). See MEGRIMS.

MÉNIPPÉE, mā'nē'pā'. A political satire in prose and verse, published in France in 1594, directed against the Catholic League and in favor of political religious toleration. The name is borrowed from the *Satira Menippea* of the Roman satiric poet Varro, who had taken as a model the Greek cynic Menippus, Diogenes' pupil. Its full title was *De la vertu du Catholicon d'Espagne et de la tenue des Etats de Paris.* It was the joint work of Leroy, Gillot, Passerat, Rapin, Chrestien, Pithou, and Durant, chiefly lawyers. It ostensibly reports an assembly of the states at Paris, with a satirical introduction and a burlesque close, and is the best travesty of its kind in any language before Butler's *Hudibras* (1663). Its political effect was immediate and lasting. The *Ménippée* is well edited by Labitte (1801). For a clear analysis of this satire, consult Suchier and Birch-Hirschfeld, *Geschichte der französischen Litteratur* (Leipzig, 1900).

MENIP'PUS (Lat., from Gk. Μένιππος) (c.250 B.C.). A Greek philosopher of the Cynic school, born at Gadara, in Syria. He is said by Diogenes Laertius to have been a slave by birth, and to have acquired considerable wealth, the loss of which caused him to hang himself. His writings, now completely lost, were a medley of prose and verse in which he satirized the follies of men, particularly of philosophers. These were the model for Varro's *Menippean Satires,* as well as for satires of Meleager and Lucian. See MÉNIPPÉE. Consult Rudolf Helm, *Lucian und Menipp* (Leipzig, 1906), and Christ-Schmid, *Geschichte der griechischen Litteratur,* vol. ii, part i (5th ed., Munich, 1911).

MENKEN, mĕn'ken, ADAH ISAACS (1835–68). An American actress, born at New Orleans, La. Her maiden name was Dolores Adios Fuertes. She made her début as a danseuse at the New Orleans French Opera House and subsequently appeared in Cuba and New Mexico. In 1858 she took part in *Fazio* in her native city; played with great success the rôle of Mazeppa in England in 1863–64; and appeared at Paris in *Les pirates de la Savane* in 1866. Subsequently she played in Vienna and again in London and Paris. She was noted as a woman of extraordinary beauty, culture, and brilliancy. She was married successively to Alexander Isaacs Menken, musician (1856), John C. Heenan, pugilist (1859), Robert H. Newell, humorist (1863), and James Barclay (1866). A volume of poetry by her was published as *Infelicia* (1868).

MEN'NONITES. A denomination of evangelical Protestant Christians which arose in Switzerland in the sixteenth century but took its name from Menno Simons, who was the leader of the sect in Holland. The beginning of the sect was in a congregation formed in Zurich in 1525 by Conrad Grebel and his associates, Manz and Blaurock. Stress was laid upon discipline rather than dogma; abstinence from the vanities of the world was imposed; and (the state being regarded as unchristian) the principle of refusing to participate in civic duties, to bear arms, and to take oaths was upheld. The movement begun at Zurich extended through Switzerland and into southern Germany and Austria. The attitude of its adherents towards the state exposed them to persecution, which continued in Switzerland through the whole of the sixteenth century and provoked emigrations into Moravia and Holland. The Anabaptists (q.v.) were active in Westphalia at the same time, and, professing some of the same views with Grebel's followers, gave occasion for the introduction of heresies and troubles. After the Anabaptist disaster at Münster Menno Simons (q.v.) became a leader among the followers of Grebel and placed their movement upon a sounder footing. He organized congregations in northern Germany and Holland, and by virtue of his piety, discretion, and ability made such an impression upon the body that, although he was not its founder, his name became identified with it. The Mennonites, like the Waldenses, were lovers of peace. The Mennonite Confession of Faith, in 18 articles, was adopted in Holland in 1632. It embodies the usual evangelical doctrines concerning God, the fall of man, the authority of the Scriptures, re-

pentance, and baptism, and contains articles relating to discipline and conduct. The view taken of the Lord's Supper accords with that of Zwingli. In the United States the sacrament is observed twice a year, usually in the spring and fall, the communicants having been previously examined concerning their spiritual condition. The rite of foot washing (q.v.) is observed in connection with it. Baptism, which is only upon confession of faith, is administered by pouring. After baptism the kiss of peace is given by the minister, or by a representative sister, if the convert is a woman. Correct discipline and rectitude are considered more important elements in the Christian life than learning and the elaboration of doctrinal points. Divorce is condemned, except for adultery. The bearing of arms and taking of oaths are regarded as wrong, and the holding of offices under the state is not encouraged. The church polity is congregational, with bishops, priests or elders, and deacons.

The Mennonite church has been divided in both Holland and Switzerland. The different branches in Holland were reunited in 1801. A division took place in Switzerland in 1620 between the Upland and Lowland Mennonites when Jacob Amen, of the Bernese Alps, held that excommunication of one party dissolved the marriage tie, and proscribed the use of buttons and the trimming of the beard. Traces of this separation are found in the United States and Canada in the Amish congregations.

The first settlement of Mennonites in the United States was made in 1683, when immigrants, induced by William Penn's offer of religious liberty, settled in Pennsylvania and built a church in Germantown, on a spot still occupied by a Mennonite meetinghouse. Another considerable immigration has taken place from southern Russia since 1871, the immigrants establishing colonies in the United States (Minnesota, Dakota, and Kansas) and Canada. So far as it is possible to ascertain, the Mennonites had in 1914 in the United States 57,337 communicants, with 1413 ministers and 736 churches. They are divided among 12 branches, which differ on points of doctrine, ritual, and discipline, or in historical origin.

I. The oldest and largest of these branches is the **Mennonite church,** the members of which are represented in 17 States, but most largely in Pennsylvania and Ohio. Their 289 churches, with 430 ministers and 23,169 communicants, are for the most part affiliated with some of the 12 district organizations, but a few of them are independent. A publishing house is established at Scottdale, Pa., where a weekly newspaper in English, the *Gosped Herald*, Sunday-school and children's periodicals, Mennonite historical and doctrinal works, and other books are published.

II. The **Bruederhoef Mennonite church** traces its origin to Jacob Huter, who was burnt at the stake at Innsbruck, Tirol, in 1536. It was at one time represented by 24 communities in Moravia, whence they were driven to Hungary. They removed to Rumania in 1767 and two years afterward to Russia, and finally, in 1874, to the United States, where they settled in South Dakota. They live under the communal system. Their language is German and their books, preserved in manuscript, including their history (*Gemeinde-Geschichtsbuch*), are in that tongue. Their 20 congregations have about 1000 communicant members and are served by 32 ministers.

III. The **Amish Mennonite church** originated in the division already mentioned, which took place in Switzerland in 1620, and represents the Oberland Mennonites, or followers of Jacob Amen, of the Bernese Alps, after whom it is named. It is second in importance among Mennonite bodies in the United States and has 176 ministers, 91 churches, and about 11,000 communicants, being most largely represented in Illinois, Pennsylvania, and Ohio. A settlement of Amish Mennonites was formed in 1824 in Wilmot Township, Ontario, where land was bought for the purpose by Christian Nafziger, of Munich.

IV. The **Old Amish Mennonite church** is the result of a separation from the Amish body which took place about 1865 over questions concerning forms of worship and methods of Church work, the separatists protesting against certain steps which they regarded as innovations, and insisting upon a strict adherence to the ancient forms and practices. They have about 2000 members, with 74 ministers and 25 churches, and are strongest in Indiana and Ohio.

V. The **Apostolic Mennonite church** is a branch derived from the Amish, which came to the United States by immigration from Europe about 1840. The discipline is less strict than in the other Amish branches. Fourteen churches are included, with 34 ministers and about 900 members.

VI. The **Reformed Mennonite church** originated in 1812, under the leadership of John Herr, who protested against laxity in the Mennonite church and insisted upon the preservation of purity in teaching and the maintenance of exact discipline. Its adherents are strict in the observance of the old ways and in their discipline, and do not as a rule hold fellowship with other denominations. They have about 1000 members, about half of them being in Pennsylvania, with 32 ministers and 32 churches.

VII. The **General Conference Mennonite church** has adopted modern views and practices to a larger extent than most of the other branches. It originated as a result of proceedings which were instituted in 1848 in Pennsylvania against a minister, John Oberholtzer, who was charged with attempting to introduce new teachings and practices. Oberholtzer and his sympathizers withdrew and formed a body called the New Mennonites. This body united with churches whose members had come from Germany and settled in Illinois and Iowa, and a General Conference was formed with three districts—eastern, central, and western. A new constitution, described as being evangelical in tone, was adopted in 1898. A publishing house is maintained at Berne, Ind., and several periodicals, in German and English, are issued. The number of members is about 13,000, with 172 ministers and 112 churches.

VIII. The **Church of God in Christ** was founded in 1859, under the leading of John Haldeman, who believed himself inspired with the spirit of prophecy. It inculcates a strict adherence to the teachings of the founders of the Mennonite church. The estimate of its numbers gives it 11 ministers, 9 churches, and 300 members.

IX. The **Old,** or **Wisler, Mennonites** represent a separation from the Mennonite church in Indiana which took place about 1870 by those who opposed the introduction of Sunday schools, evening meetings, and other new features. The first conference of this division was held in 1898.

They number about 1200 members, with 20 ministers and 12 churches.

X. **Die Bundes Conferenz der Mennoniten Brüdergemeinde** originated in Russia about 1840, and was brought to the United States by immigrant adherents between 1873 and 1876. It practices baptism by immersion and attaches special importance to evidences of conversion. It is one of the most active of the Mennonite bodies in missionary enterprise and has missionaries in China, Africa, and India. Its 27 churches have 2700 members and 46 ministers.

XI. The **Defenseless Mennonites** are likewise distinguished by the stress they lay upon the necessity of conversion and regeneration, and represent a separation from the Amish, which was led by Henry Egli. They have about 735 members in 10 churches, with 16 ministers.

XII. The **Church of the Mennonite Brethren in Christ** is the most recent in organization of the Mennonite bodies, having been formed about 1880. The Brethren are open communionists and administer baptism in any of the usual forms. They have 97 churches, 149 ministers, and about 5000 members in the United States and in Canada.

The larger Mennonite branches have in recent years displayed increased activity in missionary enterprise, in consequence of which they have enjoyed a greater relative prosperity. A general tendency has been observed towards a closer drawing together of the different branches. This was exemplified in an effort which was made in 1898 to secure the holding of a General Conference of the Mennonite and Amish district conferences, and in the coöperation of all the bodies with the Home and Foreign Relief Commission at Elkhart, for famine relief in India, for the education of the famine orphans, and for the support of the missionaries among them.

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MEN'NO SI'MONS (1492–1559). The founder of the later school of Anabaptists (q.v.) in Holland, from whom the Mennonites (q.v.) take their name. He was born at Witmarsum in Friesland in 1492; took orders in 1516; and was a priest in his native place from 1531 to 1536. The study of the New Testament, however, excited grave doubt in his mind regarding the truth both of the doctrine and constitution of the Church, and in 1536 he withdrew from it altogether. He attached himself to the party of the Anabaptists, was rebaptized at Leeuwarden, and in 1537 was appointed a teacher and bishop in the university of what was then known as the Old Evangelical or Waldensian church at Groningen. Henceforth his great endeavor was to organize and unite the scattered members of the Anabaptist sect in Holland and Germany. With this design he spent much time in traveling; but Friesland was his chief residence until persecution compelled him to flee. Finally he settled in Oldesloe in Holstein, where he was allowed to establish a printing press for the diffusion of his religious opinions. Here he died, Jan. 13, 1559. He was a man of earnest and spiritual nature, with no trace about him of the wild fanaticism of the earlier Anabaptists. His book of doctrine, *Elements of the True Christian Faith*, was published in Dutch in 1539. His works in English translation are published by the Mennonite Publishing Society at Elkhart, Ind. Consult his *Life* published in Dutch by F. C. Fleischer (1892); also, R. Barclay, *Inner Life of Religious Societies of the Commonwealth* (London, 1877).

MEN'OBRAN'CHUS. A genus of large newts, of the family Proteidæ, represented in the United States only by the mud puppy (q.v.).

MENOCAL, mā'nō-käl', MARIO GARCÍA (1867–). A president of Cuba. He was educated at Cornell University as a civil engineer, which profession he followed most of his life. During the war against Spain (1895–98) he served in the Patriot army with some distinction, but upon the conclusion of peace returned to his profession and was the managing director of the Cuban American Sugar Company, in charge of one of its large estates in Cuba. In 1912 he was elected president on the Conservative ticket, chiefly on the ground of the administrative ability which he had shown in business. His policy was to endeavor to cement better relations with the United States, to introduce economy in the administration, and to secure financial reforms for the country. He labored to give Cuba a clean, stable, and economical government, but experienced considerable opposition and criticism of his policy.

MENOMINEE, mē-nŏm'ī-nē, or MENOMINI (wild-rice men, so called because of their great use of the wild rice which grows abundantly in their country). A considerable Algonquian tribe, formerly ranging over northern Wisconsin and the adjacent upper Michigan, chiefly along the river of the same name, and now gathered upon a reservation near Green Bay, Wis. In their general characteristics they resemble the Ojibwa, but they speak a distinct language. French missionaries established a mission among them in 1670, and they remained faithful to the French interest until the end. They aided the English in the Revolution and in the War of 1812 and fought under Tecumseh during the latter struggle. In 1910 they numbered 1422. Consult W. J. Hoffman, "The Menomini," in *Bureau of American Ethnology, Fourteenth Annual Report*

(Washington, 1896), and Alanson Skinner, "Social Life and Ceremonial Bundles of the Menomini Indians," in *American Museum of American History, Anthropological Papers*, vol. xiii (New York, 1913).

MENOMINEE. A city and the county seat of Menominee Co., Mich., 165 miles north of Milwaukee, Wis., and opposite Marinette, Wis., with which it is connected by three bridges. It is situated on Green Bay, at the mouth of the Menominee River, and on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Wisconsin and Michigan railroads (Map: Michigan, B 3). It is also the western terminus of the car ferries of the Ann Arbor Railroad. One of the greatest lumber-shipping ports in the State, Menominee has numerous saw and planing mills and a great variety of manufactures, including electrical appliances, telephones, shoes, paper, steam boilers, heavy machinery, boxes, beet sugar, automobile trucks, baby carriages, canned goods, packing-house products, etc. The city is the seat of Menominee County Agricultural College and contains a public library and museum, several fine schools, well-kept parks, and a public hospital. Menominee, first incorporated in 1883, is governed under a charter of 1905, which provides for a mayor, chosen biennially, and a unicameral council which elects most of the administrative officials, only the supervisor, city treasurer, and justice of the peace being chosen by popular election. Louis Chappieu, a trader, settled here in 1799; but the city really dates from 1883, when the first mill was built here. Pop., 1900, 12,818; 1910, 10,507.

MENOM'ONIE. A city and the county seat of Dunn Co., Wis., 69 miles by rail east of St. Paul, Minn., on the Red Cedar River and on the Chicago and Northwestern and the Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, B 4). It has a fine memorial library, the Stout Institute, a county normal school, and a county agricultural school. The Dunn County Asylum is near the city. Other noteworthy features are the courthouse, city hall, Federal building, and Lake Menomin. The industrial interests are represented by brickyards, foundries, and machine shops, carriage and wagon works, and manufactories of gasoline engines, cigars, dairy products, pianos, flour, etc.; and the commercial interests by a large trade in brick, live stock, flour, wheat, and fur. The city was formerly an important manufacturing and distributing centre for lumber. Menomonie adopted the commission form of government in 1912. Pop., 1900, 5655; 1910, 5036.

MEN'OPAUSE. See MENSTRUATION.

MEN'OPOME. The hellbender (q.v.).

MENORRHAZIA. See MENSTRUATION.

MENOU, *me-nōō'*, CHARLES DE. See CHARNISE, SEIGNEUR DAULNAY DE.

MENPES, *mĕn'pĕs*, MORTIMER (1859–). An English painter, etcher, and draftsman. He was born at Adelaide, South Australia, was educated at Port Adelaide, and at 19 went to London. There he studied at South Kensington, and then went to Pont Aven in Brittany, where he remained three years. Yet he was largerly self-taught in art. In 1900 he was artist for *Black and White* in the South African War. Of extraordinary versatility, he held more exhibitions in London than any contemporaneous artist. He traveled in many lands, including Japan, India, Mexico, Spain, Morocco, and Brittany, everywhere painting in oil and water color and drawing and etching scenes and objects of interest or beauty. His work shows a refined sense of color, and power and delicacy of draftsmanship. In his Japanese studies he invented a process of painting in water color by which he attained uncommon brilliancy of effect, and he also revived the art of printing in color from etched plates. In later years he turned his attention to portraiture on a small scale, where his mastery of many mediums and skill as a draftsman are effectively shown. He was elected a fellow of the Royal Geographical Society and in 1885 became a member of the Society of British Artists. He published, among other works: *World Pictures* (1902); *Whistler as I Knew him* (1904); *Rembrandt* (1905); *India* (1905), with Mrs. F. A. Steel; *Sir Henry Irving* (1906).

MENSES, *mĕn'sēz*. See MENSTRUATION.

MENSHIKOV, *mĕn'shĭ-kŏf*, ALEXANDER DANILOVITCH (1673–1729). A Russian field marshal and Minister of State. He was born near Moscow in 1673, in humble circumstances. His intelligent countenance attracted the notice of General Lefort, through whose patronage he was taken into the service of Peter the Great. He accompanied Peter in his travels to Holland and England, and on the death of Lefort became the Czar's chief adviser. Menshikov showed equal ability as a general and as a diplomatist, and although totally uneducated he did much to promote the education of the people and was a liberal patron of the arts and sciences. In 1702 he distinguished himself in the siege of Notemburg and was made commander of this fortress after it was taken by the Russians and renamed Schlisselbourg. During the same year Menshikov took Marienbourg; among the prisoners taken on this occasion was the girl Katherine Skavronsky, who later became the wife of Peter the Great and the Empress of Russia. In 1703 he was appointed Governor of Ingermanland, Coreles, and Eastland. On Oct. 30, 1706, he defeated the Swedes at Kalisz. He contributed to some of the Czar's other victories, was made a field marshal on the field of Poltava, 1709, and after the battle compelled Lewenhaupt to capitulate with a great part of the Swedish army. In 1710 he took Riga, in 1712 he led the Russian troops into Pomerania and Holstein, and in 1713 took Stettin, but gave it up to Prussia contrary to the will of the Czar. This and his avarice so displeased Peter that Menshikov was court-martialed and condemned to death, but he was pardoned on payment of a heavy fine. During the reign of Catharine I he regained his influence at court, and after her death governed Russia with almost absolute authority in the name of Peter II. His daughter was about to marry the young Czar when Menshikov lost his influence and was banished to Siberia, September, 1727. His estates and treasures were confiscated. He died Nov. 12, 1729.

MENSHIKOV, or **MENTCHIKOV,** ALEXANDER SERGEIEVICH, PRINCE (1787–1869). A Russian statesman and general, the great-grandson of Alexander Danilovich Menshikov. He participated in the campaigns of 1812 to 1815 against Napoleon. In 1820 he was appointed commander of the Black Sea fleet, but he resigned four years later because of insufficient acquaintance with naval matters. During the Russo-Turkish War of 1828–29 he took Anapa and was wounded at Varni. In 1831 he was made Governor-General of Finland. In 1836

he became Minister of Marine and did much to increase the effectiveness of the Russian navy. In 1853 he was sent as Envoy Extraordinary to Constantinople just before the rupture which resulted in the Crimean War, but he was not, as is frequently stated, responsible for the rupture. During this war he became prominent as defender of Sebastopol, where he showed the greatest energy until his retirement on account of ill health in March, 1855. He died at St. Petersburg.

MEN'STRUA'TION. The periodic discharge of sanguineous fluid which issues from the generative organs of the human female during the period in which she is capable of procreation.

The first appearance of this discharge, to which are applied the terms menses and catamenia, indicates the approach of sexual maturity, and is accompanied by enlargement of the mammary glands, a growth of the external genitals, an increase of hair upon the *mons Veneris*, and an accession of reserve, thoughtfulness, and maturity. Menstruation usually commences between the fourteenth and the sixteenth years and terminates between the fortieth and fiftieth years. The cessation of the menstrual flow is called the menopause. The interval between successive menstrual periods is about four weeks, although it is oftener shorter; and the duration of the flow is usually three or four days, but is liable to great variations even in health. The first appearance of the discharge is usually preceded and accompanied by pain in the loins and headache, malaise, depression, and restlessness, and in many women these symptoms invariably accompany the discharge. As a general rule there is no menstrual flow during pregnancy and lactation, and its cessation is one of the first signs that conception has taken place. In robust young girls who have lived an outdoor life there is no disturbance experienced at the appearance of the menses. In many others, however, there is considerable nervous excitement, consisting of irritability, emotion, depression, flushing, and throbbing of the head.

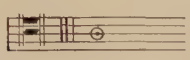
Difficult and painful menstruation is called dysmenorrhœa. During such nervous manifestations the girl should be treated as an invalid, and studies should not be persistently prosecuted. Avoidance of drains upon physical and mental powers should be enjoined, and abundant daily outdoor life should be secured. Other disorders of the menstrual function are amenorrhœa (q.v.), or lack of flow, and menorrhagia, or metrorrhagia, excessive flow. The latter is generally a sign of serious disease of the uterus or its appendages and demands prompt medical attention.

MEN'SURABLE MUSIC (Lat. *mensurabilis*, measurable, from *mensura*, measure). Strictly speaking, all music written in notes that have a definite time value. In a specific sense the term is applied to the music written between the beginning of the twelfth and the seventeenth centuries, before the invention of the line dividing a composition into bars. Before the twelfth century the choral note of the plain chant indicated only the pitch. The duration of each note was left to the individual singer and arbitrarily determined by the rhythm of the text. As long as music was sung in unison this system answered all practical purposes. But with the introduction of harmony and the development of polyphonic music, employing a number of independent voices, an imperative need made itself felt to fix the duration of the individual note. Mensurable music, therefore, borrowed the forms of the notes as used in the plain chant. These were: the large (*maxima* or *duplex longa*), ▬; the long (*longa*), ▬; the breve (*brevis*), ■; and the semibreve (*semibrevis*), ◆. To these were added the minim (*minima*), ◆, and semiminim (*semiminima*), ◆. For nearly 300 years the notes were written in this form. At the beginning of the fifteenth century the black notes were gradually supplanted by the white or open notes: ▭, ▭, ▭, ◇, ◇. For the smaller notes both the black and white forms continued in use: semiminim, ◇ or ◆; croma or fusa, ◇ or ◆; semicroma or semifusa, ◇ or ◆. Even as early as the sixteenth century rounded notes were substituted for the square ones in writing music. But it was not until 1700 that the round forms were generally adopted by music printers.

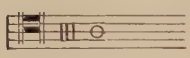
Out of reverence for the Trinity triple time was regarded as *perfect* time, whereas duple time was *imperfect*. A division of a note into three of the next smaller kind was *mensura perfecta;* into two of the smaller kind, *mensura imperfecta*. This division was indicated by certain signs, but a sharp distinction was made between the division of a long into breves, or of a breve into semibreves. These signs were placed at the beginning of a composition. The division of a large into longs or of a long into breves was known as *modus;* of a breve into semibreves as *tempus;* of a semibreve into minims as *prolatio*. The *modus* itself was further distinguished as *modus major* (division of a large into longs) and *modus minor* (division of a long into breves). A still further subdivision of both the *modus major* and *minor* was into *perfectus* (triple time) and *imperfectus* (duple). *Tempus* was thus also subdivided into *perfectum* and *imperfectum;* whereas in the case of *prolatio* this division was designated as *major* and *minor*. The following table gives a complete view of this system with the various signatures:

Modus major perfectus	1 ▬ = 3 ▬,	}
Modus major imperfectus . . .	1 ▬ = 2 ▬,	}
Modus minor perfectus	1 ▬ = 3 ▬,	|||, ||
Modus minor imperfectus	1 ▬ = 2 ▬,	|||, ||
Tempus perfectum	1 ▬ = 3 ◇,	○
Tempus imperfectum	1 ▬ = 2 ◇,	C
Prolatio major	1 ◇ = 3 ◇,	• within tempus sign.
Prolatio minor	1 ◇ = 2 ◇,	no dot.

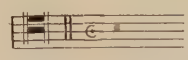
The sign of the *modus major* was the same for the *perfectus* and *imperfectus*. The following sign for the *modus minor* determined the *modus major*. If the sign was followed by or , it was *modus major perfectus;* if followed by or , it was *modus major imperfectus*. The *length* of the vertical bars had reference to the *modus minor*, the long bars indicating the *perfectus*, the short ones the *imperfectus*. The *number* of vertical bars referred to the division of the large into two or three longs. The *prolatio* sign appeared only in connection with the *tempus* sign. Thus ⊙ meant *tempus perfectum, prolatio major;* ⊂ *tempus imperfectum, prolatio minor*. If the tempus sign appeared without a dot it always meant that *prolatio minor* was understood. The following table will make this clear:



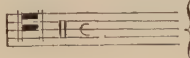
Modus major perfectus.
Modus minor perfectus.
Tempus perfectum.
Prolatio major.



Modus major perfectus.
Modus minor imperfectus.
Tempus perfectum.
Prolatio minor.



Modus major imperfectus.
Modus minor perfectus.
Tempus imperfectum.
Prolatio major.



Modus major imperfectus.
Modus minor imperfectus.
Tempus imperfectum.
Prolatio minor.

The time value of the different notes as fixed by these signs or signatures was known as the *integer valor notarum*. But these fundamental values could be changed by means of *augmentatio, diminutio,* and *proportio*. *Diminutio* reduced the value of the notes in triple time to one-third, in duple time to one-half of the original value. It was indicated by a vertical line through the signature, , or by affixing a number to the tempus sign, ○ 2 or ○ 3. Time indicated thus always denoted a lively tempo, corresponding to the modern *allegro*. *Augmentatio* signified the restoration of the *integer valor* of notes reduced by *diminutio*. It was indicated by writing the ordinary sign of the *integer valor*, ○ ⊂. A change of the *integer valor* by means of fractions was known as *proportio*. Thus $\frac{3}{1}$ meant that the time was to be accelerated, so that *three* breves now had the same duration as *one* breve of *integer valor*. But $\frac{1}{3}$ meant the opposite, viz., that the time was to be retarded, so that *one* breve now had the same duration as *three* breves of the *integer valor*. A special kind of *proportio* was that indicated by $\frac{3}{2}$, known as *hemiolia*.

Alteratio was the doubling of the time value of the second of two notes of the same kind when a tripartite note of the next larger kind followed. Generally the two smaller notes stood between two of the larger kind, or were separated from the following notes of equal or smaller value by a *punctum divisionis*. Thus, in *tempus perfectum* (○, tripartite), ◇ ◇ would be expressed in modern notation (values reduced one-half) .

An important factor in the theory of mensurable music was the *color* of the notes. The ordinary note was black. In the fourteenth century a red note (notula rubra) was used. Originally this red note was used instead of signatures to denote a change from *perfectio* to *imperfectio*, or vice versa. Soon it was definitely used to indicate *imperfectio* only. For want of red color it was often left open or white (notula alba), and during the fifteenth century the white note had the same meaning as the red note of the fourteenth. When finally the white notes were generally adopted (during the sixteenth and seventeenth centuries), *imperfectio* was denoted by the black note (notula nigra).

A group of two or more notes to be sung on one syllable was called *ligatura*. When only two notes were given to one syllable, they were written as one and called *figura obliqua*.

In ligatures of more than two notes the time value of the individual notes was not determined from their actual shape but from their position. The value of the first note could be a breve or a long. In the former case the term *proprietas*, in the latter *improprietas*, was applied. If the second note was lower than the first, *proprietas* was indicated by a vertical line (cauda) downward on the left side of the first note, ; if the second note was higher, the *cauda* was wanting, . In both cases the first note is breve. *Improprietas* was indicated by adding the *cauda* to the first note if the second was higher, and omitting it if the second was lower, , . Here both first notes are longs.

Out of this system of notation our modern system of notation has been gradually evolved. Consult: H. Müller, *Eine Abhandlung über Mensuralmusik* (Leipzig, 1886); J. Wolf, *Geschichte der Mensuralnotation von 1250–1460* (ib., 1904); H. Bellermann, *Die Mensuralnoten und Taktzeichen des 15. und 16. Jahrhunderts* (Berlin, 1906); H. Riemann, *Kompendium der Notenschriftkunde* (Ratisbon, 1910); J. Wolf, *Handbuch der Notationskunde* (Leipzig, 1913).

MENSURA'TION (Lat. *mensuratio*, from *mensurare*, to *measure*, from *mensura*, measure, from *metiri*, to measure). A branch of applied mathematics dealing with the calculation of lines, angles, surfaces, and volumes from measured data. The metrical relations between lines and angles are computed chiefly by the principles of trigonometry (q.v.). The mensuration of common surfaces and volumes, however, can generally be effected by the principles of geometry. For the purposes of either direct measurement or computation a unit is necessary. The straight line is measured by direct comparisons with some linear unit, as the inch, foot, yard, or meter. But in measuring a surface or volume it is unnecessary to apply an actual square or cubic unit, or even to divide the magnitudes into such squares or cubes. It is only necessary to measure certain of its boundary lines or *dimensions* and from these measurements to calculate the contents in terms of the appropriate unit, e.g., if a inches and b inches are the lengths of the adjacent sides of a rectangle, its area is $a \cdot b : 1$ square inch $= ab$ square inches; i.e., the number of square units of area in a rectangle is equal to the product of two numbers which rep-

resent its base and altitude, measured by the same linear unit. The areas of other figures are found from this area by the aid of certain relations or properties of those figures; e.g., the area of a parallelogram is the same as the area of a rectangle having the same base and altitude, and is therefore equal to the base multiplied by the altitude. As a triangle is half of a parallelogram of the same base and the same altitude, its area is one-half the product of its base and altitude. Certain quadrilaterals and polygons are measured by dividing them into triangles, the area of each of which is separately calculated. (For the area of the circle, see CIRCLE.) By reasoning similar to that employed in the case of areas, it is shown that the volume of a rectangular parallelepiped or prism is found by multiplying together the length, breadth, and thickness; and of the oblique parallelepiped, prism, or cylinder, by multiplying the area of the base by the height.

As in case of the circle, so in the mensuration of the cylinder, cone, and sphere, the theory of limits (see LIMITS, THEORY OF) is applied in connection with the circumscribed and inscribed figures. The following formulas of mensuration will be found convenient:

Abbreviations: b, base; h, altitude; r, radius; a, area; c, circumference; p, perimeter; s, slant height; v, volume; m, mid section; α, the number of radians in an angle.

Parallelogram	$a = bh.$
Triangle	$a = \frac{1}{2}bh.$
Trapezoid	$a = \frac{1}{2}(b + b')h.$
Parallelepiped	$v = bh.$
Prism	$v = bh.$
Lateral area, right prism	$a = ph.$
Prismatoid	$v = \frac{1}{6}h(b + b' + 4m).$
Pyramid	$v = \frac{1}{3}bh.$
Lateral area, regular pyramid	$a = \frac{1}{2}ps.$
Frustum of pyramid	$v = \frac{1}{3}h(b + b' + \sqrt{bb'}).$
Lateral area, frustum of regular pyramid	$a = \frac{1}{2}(p + p')s.$
Right circular cylinder	$v = bh = \pi r^2 h.$
Lateral area	$a = ch = 2\pi rh.$
Right circular cone	$v = \frac{1}{3}bh = \frac{1}{3}\pi r^2 h.$
Lateral area	$a = \frac{1}{2}cs = \pi rs.$
Frustum of right circular cone	$v = \frac{1}{3}\pi h(r_1^2 + r_2^2 + z_1 r_2).$
Sphere	$v = \frac{4}{3}\pi r^3, \quad a = 4\pi r^2.$
Lune	$a = 2\alpha r^2.$
Spherical polygon	$a = \alpha r^2.$
Zone	$a = 2\pi rh.$
Spherical segment	$v = \frac{1}{6}\pi h[3(r_1^2 + r_2^2) + h^2].$
Spherical sector	$v = \frac{2}{3}\pi r^2 \quad h = \frac{1}{3}\ br.$
Circle	$c = 2\pi r, \quad a = \pi r^2, \quad arc = \alpha \cdot r.$

For the mensuration of geometric solids, consult Holzmüller, *Elemente der Stereometrie* (2 vols., Leipzig, 1900).

MENT. See MONT.

MENTAL CONSTITUTION. A somewhat popular term, used with a meaning analogous to "bodily constitution," "physical constitution," and the like, to denote the general make-up of individual minds. Language is rich in words for individual differences of ability, temperament, character, and general organization. For example, men are able or inefficient, talented or stupid, sympathetic or cold, emotional or phlegmatic, rash or cautious, steady or unreliable; they are weak-willed and strong-willed, broad-minded and narrow-minded, slow and quick. Differences of this kind, manifested in learning, acting, thinking, are referred to, loosely, as differences in mental constitution. Their analysis and classification are undertaken by individual psychology. (See INDIVIDUAL PSYCHOLOGY; MENTAL TESTS.) They are to be explained in terms of inherited and acquired tendencies or predispositions in the nervous system. See DETERMINING TENDENCY; DISPOSITION; HABIT.

MENTAL DEFECTIVES. Definition. The mentally deficient person is one who by reason of anatomical or pathological conditions occurring in the brain at or before birth is unable to compete successfully with his normal fellows in play, study, or work. Though an adult, he cannot gain a livelihood independently, but requires guidance and some one to take the initiative and assume responsibility. These persons are spoken of as *aments*, i.e., without mind, as distinguished from *dements*, who had minds but lost them.

Classification. A person having almost a normal mind, but not knowing more than a child of 12 years, is called a *moron*, from the Greek *μωρός*, a "fool"; one having the mind of a child of seven to 12 years is *feeble-minded;* one with the mentality of three to seven years is an *imbecile;* and the individual who remains at the state of development of two years is an *idiot*.

A normal child at two years of age will repeat rhymes, distinguish colors, obey simple commands, and imitate the acts of others. At seven years of age a child will count up to 20, knows the names of coins in common use, can tell time correctly, and can make readable copy of simple sentences. At 12 years of age the child can construct sentences containing three given words, can give rhymes rapidly to suggested words, and can define such words as "charity," "justice," and "goodness." The moron is likely to be nearly normal in feature, in expression, and in physical development. The defectiveness may not appear until it is found that he does not keep to a piece of work or study, or does not show normal resistance to unwise advice or immoral example. Such persons have little power of inhibition, but are like an engine without a balance wheel or governor. They are very subject to their environment. This is the group that becomes a large factor in the problems of criminality, truantism, pauperism, and prostitution. The feeble-minded person does not easily pass for normal; he is likely to be under normal size, have a head of peculiar shape, e.g., boat-shaped (scaphoid), or very round like a turned post, or high like a tower (oxycephalic). There is frequently asymmetry of the skull and face. The eyes may be of different colors and strabismus or other errors of action exist. The ears are often large and of unequal size, and may exhibit a Darwinian tubercle suggesting a lower animal. The palate is in many cases very high, easily earning the name "Gothic arch."

The imbecile is still farther from normal in appearance. He has little activity of the senses

and accordingly is without facial expression; the muscles of his face, like the others of his body, are flabby and without tone. His palate may be high and his teeth very irregular and subject to early decay. A normal head is 22 inches in circumference, but that of the imbecile, besides being very asymmetrical, may be microcephalic, very small; or hydrocephalic, very large; the imbecile is careless about his clothing, though he may be able to put it on.

The idiot is the lowest of the group. He may have no more stigmata than the imbecile, but is usually a more helpless-looking object. He is likely to be paralyzed and is often an epileptic. His mentality is so meagre that he cannot protect himself from harm and injury. His "mind is a negation." He must be clothed and fed by others, often requiring as much attention as an infant.

To this general classification must be added three other varieties: the *cretin, Mongolian idiot,* and the *amaurotic family idiot.* The cretin is a short, thickset little individual 3 or 4 feet high, having heavy features, broad nose, thick lips and tongue, thick, dry skin, and coarse, wiry hair. Upon the shoulders above the collar bone are pads of fat. The limbs and so-called long bones are very short. The hands are short and pudgy. The development of puberty is delayed, if indeed he reach that stage at all. Cretins are usually happy folks and capable of some instruction. The cause in these cases has been traced to absence of the thyroid gland, leading to perverted metabolism. The trouble may be overcome by administering thyroid-gland extract by mouth.

The Mongolian idiot is so called because he has an Oriental cast of countenance, due to obliquity of the eye slit. The eyes seem to be a bit on the bias. There is no asymmetry of the skull, but a round head with regular features. An idiot of this sort is usually the last born in a family and the only one mentally defective. As is well known, there are many families in which all the members are defective, but they belong to the feeble-minded or imbecile groups.

The amaurotic idiot is blind from degeneration of the optic nerve. Amaurosis in Latin and Greek means "to darken." Examination with the ophthalmoscope reveals a cherry-red spot in the fovea centralis of the macula lutea, which has now become not a yellow spot, but a white spot. The cherry spot is pathognomonic of this disease. There is a gradual lessening of strength until the child can no longer sit up and soon becomes wholly paralyzed. This is due to degeneration of the ganglion cells throughout the gray matter of the brain and cord. The disease is first discovered by the parents at about six months of age and progresses to a fatal termination in about a year. It is a singular fact that all cases reported thus far have been of Jewish parentage. Frequently there are two or more affected in the same family. There is neither cure nor likelihood of betterment.

Prevalence. Data collected in studying 10,000 school children in California, the same number in New Jersey and in Philadelphia, showed about 3 per cent to be feeble-minded. The British Royal Commission, in a study of a population of 3,873,151, found aments at the rate of 3.28 per thousand, i.e., one mental defective to 248 persons. Four aments per thousand is a very conservative estimate and will enable one to calculate the number in any community at any time. For example, in 1915 the United States population of 100,000,000 would contain 400,000 mental defectives. It is interesting to note that the insane, i.e., those who had minds and lost them, aggregate the same as the mentally deficient. Fifty per cent of the youths in reformatories are mentally defective, and 25 to 50 per cent of adult prisoners are the same. The Commission for the Investigation of the White Slave Traffic, so called, found more than half the number of prostitutes feeble-minded. Truants and paupers are largely feeble-minded, 80 per cent and 50 per cent respectively.

Cause. Mental deficiency is attributed to heredity, accidents at birth or in early life; to diseases such as meningitis, convulsions, and fevers; to traumatism; to the fact that the parents were alcoholic, tuberculous, syphilitic, or neurotic. Many of these conditions are concomitant, but proofs of cause and effect are wanting. There are multitudes of alcoholic parents without feeble-minded children; 66 per cent of the defectives come from alcoholic families most of which are physically and financially poor. Goddard studied thoroughly the family history of 300 cases and found that 54 per cent of them were undoubtedly hereditary. His studies showed many interesting alleged causes, and only 2.6 per cent unaccounted for. In former years only 25 per cent of patients having cerebrospinal meningitis recovered, and of these 97 per cent were mentally defective. Now that we have the serum treatment for meningitis this factor should be eliminated. Atwood found that 20 per cent of 200 defectives gave a positive Wassermann reaction, yet syphilis cannot be claimed as the sole cause of their condition.

Mendelian laws hold good in the heredity of man as elsewhere in nature, and according to Goddard the real cause of mental defect "is bad protoplasm." Tredgold holds that "primary amentia is a manifestation of a pathological germinal variation which has been produced by environment, and that the germinal change is of the nature of a vitiation." Consanguinity is not a causative factor in healthy families, nor in others unless they be neurotic. The hereditary character of the condition is recognized by individual students everywhere and also by the British Royal Commission as a body. The lawmakers and public officers of most countries have in recent years been giving careful consideration to the treatment of these unfortunate persons.

Segregation. All mentally defective children should be placed out of the family while young; first, because they cannot associate on equal terms with the normal members; secondly, because they require expert teaching and oversight to improve their condition. This may be done by the wealthy in private training schools, and should be insisted upon for others in public institutions. Only 24 States of the United States (1914) have institutions fit for the care of the mentally deficient. Although there are 30 such places, they can accommodate only 19,000 persons. Older persons should be in institutions in order that they may be under responsible direction and enabled to take part in useful work —at all events to be safe from bad moral influences and temptations if they be of high-grade mentality. It is the high-grade defectives that are a menace to society, especially the females, who so readily become mothers. At the New

York State Reformatory for Women a study was made of 2000 prostitutes, with the result that 29 per cent were decided to be subnormal. New York State also has an institution especially for women during the child-bearing age.

In connection with this phase of the subject there has been much discussion regarding asexualization. While all students are in favor of segregation, accommodations do not exist for one in twenty of those who need it. Sterilization as now performed is simply vasectomy in the male and ligation of the Fallopian tubes in the female. There being no removal of the glands peculiar to either sex, the individual retains general characteristics but loses the power to reproduce. Laws have been passed in several States legalizing the operation, but it has not become a popular procedure. Some idea of the expense to the public of feeble-minded families may be had by reading *The Jukes*, by Dugdale, or *The Kallikak Family*, by Goddard. The cost to the State for the care of criminals, paupers, and incompetent persons because of mental deficiency is counted literally in millions of dollars.

Instruction. Various attempts have been made to teach idiots, one of the earliest being that of Itard's wild boy found in the forest of Aveyron in 1799. The boy's ignorance was largely due to deprivation, so that some slight success was attained in the attempt to improve his condition. One of Itard's pupils was Edouard Seguin. In 1837 Seguin began to instruct idiots in the Hospital for Incurables in Paris. He regarded the idiot as an undeveloped infant and, proceeding upon a definite plan, instituted a course of physiological education. He insisted upon the value of food, air, and exercise, i.e., the need of a healthy body for a useful mind, and began then to train the senses. He visited America several times and made his home here from 1863, when he established in New York the Seguin Physiological School for Feeble-Minded Children. Before the Academy of Sciences in Paris it was declared that Seguin had solved the problem of the education of idiots. Not only are there special institutions, public and private, for the defectives, but special classes are formed in connection with the schools of most large cities. Such classes existed in Halle about 1863 and in Dresden in 1867. New York City had in 1914 200 ungraded classes with 3100 children.

In teaching the mentally defective, the games and exercises are designed especially to fix the attention and promote coördination. Music appeals to the feeble mind, and the children learn to march and play to the accompaniment of piano or other instrument. Reading, writing, and number work may be learned by the higher grade pupils, yet they always show a certain amount of childishness in composition. The exact degree of intelligence is standardized by various methods, notably the Binet test. (See MENTAL TESTS.) The boys are taught mat-making, weaving, basket making, shoe mending, tinsmithing, carpentering, gardening, and farming. The girls are taught the care of the house or wards, sweeping, dusting, making beds, setting table, and being useful in the kitchen. They learn to sew and do fancywork, the fineness of which depends upon their mentality. Farm colonies are operated by several States with great benefit to the inmates, both in body and mind. A feeble-minded person rarely grows much beyond the mental age that he stands the test for; therefore he should be given all the training possible in order that he may not drift below his station.

Treatment. There is no remedy for the majority. Cretins may be practically cured if the condition is recognized before they are six months of age and thyroid extract is given systematically. In 1890 and the following years craniectomy was practiced extensively in the hope that removing strips of bone would allow the brain more room for growth. The procedure was a failure. Drainage of hydrocephalus by either the external or the internal method has not helped conspicuously. The mentally defective may have diseases of the body which indirectly impair their minds. Such must be treated, especially if the infirmity is of the nervous system.

Results. The investigation of Dr. Caldecot indicates the result of training in 341 patients discharged from the institution because they were supposed to be suited to life outside. The time covered was 15 years. He says "3.25 per cent were earning wages, 3.81 per cent were at home very useful. 7.5 per cent were at home and useful, and the rest, i.e., 85.5 per cent, were no good and should have been taken care of for life."

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MENTAL HEALING. See FAITH CURE; HYPNOTISM; MESMERISM; PSYCHOTHERAPEUTICS; SUGGESTION.

MENTALITY OF INSECTS. See section on *Social Insects* under INSECT; also INSTINCT.

MENTAL PATHOL'OGY. The science of abnormal mental process. The intimate dependence of consciousness upon the functioning of the central nervous system enables us to approach the investigation of morbid mental conditions from the vantage ground of physiology. The brain, which is the substrate of mind, may, like any other organ of the body, exhibit (1) defects, i.e., lack of some structure, or (2) abnormality of function, whether it be (*a*) temporary, i.e., a disorder, or (*b*) permanent, i.e., a disease. "Defectives" are, then, persons who suffer, congenitally or from early childhood, from the absence of some group or groups of mental elements in consequence of some underlying defect of the nervous system; they are the blind, the deaf, the paralytic, etc. The cases of Laura Bridgman and Helen Keller, the blind deaf-mutes, are typical. From careful reports of their educational progress and from special psychological and neurological examination of their mental and physiological organization valuable data have been secured. Temporary mental derangements are found in the consciousness of dreams, hypnosis, and the intoxication of various drugs. Frequent attempts have been made to examine mind as specific phases of it are rendered anæsthetic or hyperæsthetic in these ways. Hashish (extract of *Cannabis indica*), e.g., greatly mag-

nifies our consciousness of duration and extent, and also induces visual hallucination. Chronic mental derangement is exemplified by the various forms of insanity, such as mania, melancholia, dementia, general paresis, etc.

Abnormal mental types are, as one writer puts it, "psychological experiments made for us by Nature herself." Especially is this true when the infirmity is isolated, when a single group of mental processes—e.g., a sense department—is either entirely lacking or extraordinarily emphasized. Such a state of affairs simplifies matters for the psychologist. He is able to find out the relative value of the group concerned in the normally organized mind, and, as a consequence, to proceed more successfully with the analysis of the adult human consciousness. (See PSYCHOLOGY.) Take, e.g., cases of the anæsthesia of particular internal organs which lie beyond that experimental control which is of supreme importance in the laboratory investigation of the external sense organs. Evidence of this sort has been of weight in referring the sensation of dizziness to the semicircular canals of the internal ear. (See STATIC SENSE.) From observations of senile dementia Hughlings Jackson has established the law that, in the gradual loss of memory with advancing age, the latest mental stuff, that acquired with most difficulty, first decays. The successive stages of dissolution, consequent upon the inroads of cerebral deterioration, retrace the steps of evolution. The various types of aphasia (q.v.) have been of great assistance in the solution of the problem of the cortical localization of function, as well as in the more strictly psychological problems of apperception (q.v.) and language. There are, in particular, two lines of recent work which appeal to the interest of students both of normal and of abnormal mental processes. The rapid development of mental tests (q.v.) and their application to the retarded and feeble-minded as well as to the mentally sound have led to discussion and cooperation and have raised important issues of psychophysical heredity; and the Freudian school, whose doctrines are based upon a fairly definite psychological system and whose specific method is that of psychoanalysis, has brought dreams and hysteria into the very forefront of psychological debate. It is probable that the immediate future will see a much closer *rapprochement* between psychology and mental pathology than has been realized hitherto; so that, on the one hand, mental disorders and diseases will be studied scientifically as well as handled therapeutically, and on the other hand systematic psychology will devote special chapters to a detailed consideration of typical abnormalities.

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MENTAL PROCESS. A phrase employed by modern psychology in two nearly related meanings. 1. In the first place, it is tending to replace the older static conception of mind (q.v.). Stout, e.g., defines psychology as "the positive science of mental process," in preference to speaking of it as the science of mind, and James declares that "the first fact for us as psychologists is [not that mind exists, but] that thinking of some sort goes on. . . . If we could say in English 'it thinks,' as we say 'it rains' or 'it blows,' we should be stating the fact most simply." 2. But not only is mind, as a whole, a stream of thought and feeling; each separate element of mind or mental formation that our analysis teases out of the total consciousness is itself a process. Every sensation rises, poises, falls, in its own characteristic way; even the idea, the mental thing par excellence, is termed by Wundt a "variable process," and such formations as emotion and volition bear the mark of process stamped upon them. Meaning (q.v.) and mode of connection (see FUSION; IMPULSE) are stable, but the stuff of which mind is made is essentially durative process and not stable being. Consult: *Philosophische Studien*, vols. vi, x (Leipzig, 1891, 1894); G. F. Stout, *Analytic Psychology* (London, 1896); William James, *Principles of Psychology*, vol. i (New York, 1909); E. B. Titchener, *Textbook of Psychology* (ib., 1910); *American Journal of Psychology*, vol. xxiii (Worcester, 1912).

MENTAL SCIENCE. The name given to a metaphysical system which aims to cure diseases without drugs. Its history goes back to the early Christian centuries and has sometimes been religious and sometimes philosophical. Eginhard, an intimate of Charlemagne, was the first to make recorded observations in any way analogous to modern medical cases of mental healing. In the time of Charles II and Queen Anne special powers were attributed to royalty in the laying on of hands for the healing of the sick. Parson Blumhardt emphasized the religious element in healing about a century ago, and P. P. Quimby was most conspicuous in the work in the middle of the nineteenth century in America. Since his day there has been a succession of mental healers, including the Dressers, Mary Baker Eddy (q.v.), John Alexander Dowie (q.v.), A. B. Simpson, of New York, Francis Schlatter (q.v.), Schrader, Bradley Newall, and Paul Dubois, professor of psychotherapy in the University of Bern, Switzerland. All of them endeavored to prevent disease whenever possible. All have tried to awaken in the individual the inherent but latent forces of health through the medium of literature, lecture courses, heterosuggestion and autosuggestion. Most of them encouraged the formation of reading circles and other social expedients for keeping the mind fixed on the subject of good health.

In the last half century there has been a differentiation of the groups of Mental Science healers, with the result that there are to-day Christian Scientists, adherents of New Thought, and other groups. The Christian Scientists, while in general holding to the Mental Science idea, have developed a metaphysics of their own based on the concept that matter has no real existence, and have turned the small circles of the older days of Christian Science into organized churches throughout the United States with special responsibility to the Mother Church in Boston. The New Thought group do not deny the reality of matter

and have not developed large circles of adherents, but follow in the main the teachings of men like Horatio W. Dresser, Stanton Davis Kirkham, Henry Wood, Ralph Waldo Trine, and Thomas Troward. Such men as Paul Dubois, who have perceptibly influenced the practice of medicine, have as their metaphysics some form of materialism rather than idealism, and emphasize what Dubois calls persuasion rather than suggestion. Those who regard themselves as Mental Scientists are largely individualists and have no general organization. They agree in looking upon all schemes of cure as mere expedients. They insist that man lives in a physical phase of consciousness rather than in a physical world, and that to rise out of this consciousness to what the New Thought group and Christian Scientists call a spiritual conception would involve the break-up of their conception of life and being. They urge that each individual must in a final analysis think for himself, and be content to be what he thinks he is because he thinks he is. Mental Science, therefore, while often materialistic is also individualistic, and it is in consequence impossible to determine the number of its adherents. See CHRISTIAN SCIENCE; FAITH CURE; HYPNOTISM; MESMERISM; NEW THOUGHT; PSYCHOTHERAPY; SUGGESTION.

MENTAL TESTS. Procedures whose purpose is the determination, in an individual, of the presence or absence of a particular mental content, or of the degree of a particular mental function or capacity. The term is also employed, somewhat loosely, in cases where the function upon which the procedure is directed is itself imperfectly known, or is measured only indirectly, or is (so far as we know) rather a psychophysical than a strictly mental function. We speak, e.g., of "tests" of color-blindness, of pitch discrimination, of intelligence, and of fatigue. (See these titles.) Less formally, mental tests are characterized by simplicity of technique, relatively short duration, and emphasis upon quantitative determination rather than upon qualitative analysis and direct description. They are usually, moreover, standardized procedures, applied to a number of individuals for the purpose of measuring the variation within groups, or to a single individual because of a practical interest in that person. Mental tests accordingly furnish data primarily for individual psychology (q.v.) or for applied psychology (see PSYCHOLOGY, APPLIED), and contribute only indirectly to the general science of psychology.

As early as 1877 Francis Galton suggested the use of the reaction experiment for the diagnosis of temperament. In connection with anthropological measurements of weight, height, eye color, and the like, he further developed a number of simple tests which he hoped would make it possible to "obtain a general knowledge of the capacities of a man by sinking shafts, as it were, at a few critical points."

In the early nineties of the past century mental tests came into prominence in America. Here interest centred in the question of the relation of mental to physical variations, in the determination of the range and the types of mental variation as a methodological prerequisite of general psychology, and in the problems of class and child psychology. For the most part the tests resembled experiments already employed by psychology in the investigation of the simpler mental processes. Experiments were chosen whose results could be quantitatively expressed, and which seemed likely to exhibit wide or practically significant differences; their technique was so simplified as to make practicable their application to large numbers of individuals. In Germany, a few years later, tests of a similar character were developed; the principal interest in this case was the diagnosis of insanity and the analysis of the abnormal mind. At about the same time, in France, interest in individual psychology led to the formation of tests of a somewhat different kind. In particular, Alfred Binet and his followers were of the opinion that the more specific functions (such as ability to discriminate tones or colors or to judge time intervals) not only varied less widely among individuals, but also were of less importance in the constitution of individuality, than the more general or higher functions, such as imagination, comprehension, intelligence, suggestibility, and sentiment. Here, then, since methods of investigation had not yet been devised, adaptation of already existing procedures was impossible, and the invention of new tests was a preliminary to further work.

The inventor of such a test necessarily starts with a conception (derived from theoretical or common-sense psychology) of the function to be tested, and proceeds to lay down a procedure to suit this conception. Intelligence, e.g., has been conceived as essentially an ability to combine impressions into a unified and related whole; and the test of intelligence then takes the form of filling in the gaps of a mutilated text. Tests of this sort, however, unlike the adapted tests, hardly ever measure the supposed function directly; they are merely diagnostic, or expressive of the degree of the given function; and, however valuable they may be for practical purposes, they contribute little to scientific knowledge. The single test, moreover, is inexact in that it almost certainly involves other functions than that upon which it is directed. The result of a selected series of tests, all intended to reflect a single function, is likely to give a truer measurement, and it is upon such series that the practice of the present time chiefly depends. Probably the most famous series of tests yet devised is the Binet-Simon series of graded tests. The primary purpose of these tests is the practical determination of the degree of intelligence of a child and his consequent classification as normal (i.e., as having an intelligence equal to that of the average child of his age), subnormal, or supernormal. The Binet-Simon series of 1908 comprises 56 single tests, a group of which is assigned to each age from three to twelve. A certain minimum of performance in every test constitutes a "pass"; and the subject is graded on the basis of number of tests passed, as having a degree of intelligence normal to such-and-such a year. A subject whose rank places him three years behind the normal for his age is considered mentally defective. The tests themselves are in reality simple tasks, so chosen that so far as possible their performance cannot be materially affected by formal coaching or school training. A normally intelligent three-year-old child, e.g., is required to repeat correctly after the experimenter three digits, to repeat a simple sentence containing six syllables, to tell his family name, etc.; a child of nine, to tell the day of the month, to give the days of the week in order in 10 seconds, to make change (returning 21

cents from a quarter dollar), and the like. Beside success and failure, however, peculiarities of performance in many of the tests are considered diagnostic, so that entirely satisfactory administration of the tests and the drawing of reliable conclusions therefrom seem to demand a very careful and practiced experimenter. Binet's insight into the nature of the child's mind and his ingenuity in devising not only the general scheme of the test series but also the details of method are amply attested by the fact that the series still remains essentially as he left it in 1908 in spite of severe practical trials in nearly every civilized country. Criticism has resulted, for the most part, only in modification and extension of the series.

It has been pointed out that tests which shall permit of more accurate quantitative results than are furnished by statements of mere success or failure, and also that more specific qualitative tests, are desirable; and series possessing these advantages are at present in process of development. A further recent tendency is towards the development of tests which shall determine the fitness of individuals to enter various trades or careers.

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MENTANA, mĕn-tä'nȧ. A village in Italy, 13 miles northeast of Rome, with 2379 inhabitants in 1911. It is noted as the place where, on Nov. 3, 1867, Garibaldi was defeated by papal and French troops while attempting to seize Rome and thus complete the unity of Italy. On Nov. 25, 1877, a monument was erected in honor of the adherents of Garibaldi, who was taken prisoner in this battle. See GARIBALDI.

MENTCHIKOV, ALEXANDER DANILOVITCH. See MENSHIKOV, A. D.

MEN'TEL (or MENTELIN), JOHANNES (c.1410–78). A German printer of the fifteenth century, the first to establish a press at Strassburg. To him the invention of printing was once attributed by many. The erroneous character of such an assertion was very clearly demonstrated by Von der Linde in the results of his investigation of the early history of printing in his *Gutenberg* (Stuttgart, 1878).

MEN'TER, SOPHIE (1848–1918). A German pianist, born at Munich, in which city she subsequently studied under Schönchen, Lebert, and Niest, making her début in 1863. She met with extraordinary success, particularly at Frankfort, where, in 1867, Tausig (q.v.) secured her as a pupil. Two years later she won the good will of Liszt, who became one of her stanchest friends. She made many tours and had many famous pupils, and finally retired to her home, Castle Itter, in the Tirol. Meanwhile she had become known as a remarkable virtuoso, and besides her appointments as court pianist to the Prince of Hohenzollern and the Emperor of Austria, she served for a time on the faculty of the St. Petersburg Conservatory. In 1872 she married the cellist Popper, from whom she was subsequently divorced (1886).

MENTEUR, mäN'tĕr', LE (Fr., The Liar). A comedy by Corneille (1644), modeled after Alarcón's *Verdad sospechosa*. The play is Corneille's best comedy, and the most important before the appearance of Molière.

MENTHA. See MINT.

MEN'THOL (from Lat. *mentha*, mint), or PARA-MENTHANOL (3), or PROPANOL (3), $C_{10}H_{19}OH$. A colorless crystalline substance obtained from official oil of peppermint, or from Japanese or Chinese oil of peppermint. The oil is subjected to fractional distillation, and the higher-boiling fractions are allowed to crystallize, the product being purified by recrystallization. It has the odor of peppermint and produces in the mouth a sensation of cold. It is but sparingly soluble in water, but dissolves in considerable quantities in alcohol, ether, chloroform, and other organic liquids. It is often used, especially in solution in oleic acid, as a remedy for neuralgic headache. In a solution of ten parts of alcohol to one of menthol, or in the solid form of a pencil it usually gives immediate, though not always complete, relief, when applied to the seat of pain. It has also been used to relieve itching and in asthma. Internally it has been used in small doses to relieve nausea. Finally, it is used in perfumery. Menthol melts at 43° C. (109.4° F.) and boils at 211–213° C. (412–415° F.). When dissolved in four times its weight of alcohol, in a tube 1 decimeter long, it turns the plane of polarized light 49.3° to the left per gram per cubic centimeter of solution.

The ordinary menthol just described has also been obtained synthetically. But synthesis has also produced three other varieties of menthol, having the same ultimate composition as natural menthol and differing from it only in the position occupied in the molecule by the OH group. These varieties, or "isomers," of menthol are known as *carvomenthol*, *tertiary menthol*, and *tertiary carvomenthol*.

MENTONE, mĕn-tō'nȧ, Fr. **MENTON,** mäN'tôN'. A seaport town in the Department of Alpes-Maritimes, France, on the Mediterranean, 19 miles east-northeast of Nice (Map: France, S., M 5). It is situated on the Golfe de la Paix, which here breaks into two small bays. On the north is a sheltering range of lofty mountains, the lower slopes of which are covered with orange, lemon, and olive groves, and dotted with picturesque villas and gardens. The inclosed situation of the town, dry and equable climate, and other natural advantages make Mentone one of the most popular of invalid resorts on the Riviera. The town built along the shore as a resort is modern, while the old portion retains a mediæval aspect, with narrow, winding streets; the newer portion is regularly laid out and clean. The prominent buildings are the churches of St. Michel (seventeenth century) and of the Conception; the hôtel de ville has an interesting museum of prehistoric relics. On the west coast of the bay near Cap Martin is the villa of the former Empress Eugénie. Mentone has a number of fine boulevards, the Promenade du Midi skirting the bay, and several public gardens. The chief point of interest, however, is in certain grottoes near by, in Italian territory, where Rivière discovered relics of ancient human occupation. In one of these caves, now known as the

"Grotte des Enfants" two skeletons were found at great depth to which the name "Grimaldi" man has been given (see MAN, SCIENCE OF). Mentone's harbor accommodates vessels of 26 feet draft. Mentone produces annually 45,000,000 lemons, also figs, olives, and perfumes, and has an extensive trade in fruit and olive oil. Pop. (commune), 1911, 18,001. After belonging for 500 years to Monaco, the town revolted in 1848 and attached itself to Sardinia. With the cession of Nice to France in 1861 Mentone came under French rule, the Prince of Monaco ceding his rights to France for 4,000,000 francs. Consult *Bulletins de la Société d'Anthropologie de Paris*, series 4, vol. ix (Paris, 1898), and Mortillet, *Le préhistorique* (ib., 1900).

MEN'TOR (Lat., from Gk. Μέντωρ). The son of Alcimus of Ithaca, the trusted friend of Ulysses, who, on setting out for Troy, left to him the charge of his household and the education of Telemachus. His name has become proverbial for a wise guide and counselor; as such he figures especially in Fénelon's *Télémaque*.

MENTU. See MONT.

MENU VON MINUTOLI, HEINRICH, BARON. See MINUTOLI, HEINRICH, BARON MENU VON.

MENYANTHES, mĕn'ĭ-ăn'thēz. A genus of plants. See BUCK BEAN; Plate of BRAZIL NUT.

MENZALEH, mĕn-zä'le, LAKE. A lagoon on the northeast coast of Egypt, extending from the Damietta branch of the Nile to the Suez Canal, and separated from the Mediterranean by narrow sand bars (Map: Egypt, F 1). It is 30 miles in length by about 20 miles in average breadth, is very shallow, and studded with low islands, on one of which are the remains of the ancient city of Tennesus. The lagoon has valuable fisheries, besides producing much salt.

MENZEL, mĕn'tsel, ADOLF VON (1815–1905). A German historical and genre painter, one of the foremost of the nineteenth century; also an important illustrator and lithographer. He was born at Breslau, Dec. 8, 1815, and as a lad assisted his father, a lithographer, in his work. The family removed to Berlin in 1830, and in the summer of 1833 Menzel attended the Academy schools, but soon relinquished as unprofitable the ordinary routine of training, and may truly be called self-taught. His father's death in 1832 threw the support of the family upon his shoulders and he worked hard at lithographic commissions. In 1833 he executed for the publisher Sachse "The Artist's Earthly Pilgrimage," a series of 10 drawings in pen and ink illustrating Goethe's poem, "Künstler's Erdenwallen," which attracted immediate attention. The real beginning of Menzel's triumphs was the year 1839, when he began the illustration of Kugler's *History of Frederick the Great*, a task occupying three years. These 400 designs, drawn in pencil on wood and reproduced in facsimile, brought him royal and popular favor and gave a new impetus to the art of wood engraving in Germany. This work was followed by a commission for King Frederick William IV for 200 illustrations of the edition de luxe of Frederick the Great's *Works* (1843–49), intended as a royal present to German and other notables (new ed., 2 vols., Berlin, 1886). He designed also many vignettes and other illustrations, and he invented new methods in lithography and gouache. Menzel began to paint at the age of 20, without formal instruction.

Of his paintings the best known are the episodes from the history of the great Prussian monarch. The historical fidelity, clever characterization, droll humor, and sound naturalism displayed in these compositions, combined with his thorough mastery of technique, rank Menzel as one of the dominant painters of Germany during the nineteenth century. He was, moreover, the first German painter to become imbued with the spirit of modern realism, of which he was the earliest pioneer. But as none ventured to follow him he exercised but little influence on the development of German art. He appears as the painter-historian of the modern Hohenzollern in another series, of which the "Coronation of King William I at Königsberg," in the Royal Palace, Berlin, and "Departure of the King for the Seat of War in 1870" (1871), in the National Gallery, Berlin, are the most conspicuous examples. Among a great variety of genre pictures the "Modern Cyclops" (1875, National Gallery, Berlin), representing the interior of a rolling mill in Silesia, is a sterling piece of realistic characterization and of masterly light effects. Remarkable for this latter quality, as well as for its keen satire, is "The Ball Supper" (1879), and a later noteworthy example is the "Ash Wednesday Morning" (1885), in the National Gallery, Berlin. Besides receiving various other honors, Menzel was made a Privy Councilor in 1895, and received the Order of the Black Eagle, conferring hereditary nobility, in 1898. He died in Berlin Feb. 9, 1905.

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MENZEL, WOLFGANG (1798–1873). A German historian and critic, born at Waldenburg, Silesia. He studied at Jena and Bonn, became an ardent disciple of Jahn (q.v.) and the Turner movement, taught (1820–24) at Aarau, in Switzerland, and from 1825 lived as a man of letters at Stuttgart, where he edited the *Litteraturblatt* (1826–48; again in 1852). From 1830 to 1838 he belonged to the Württemberg Diet. Unsuccessful in politics, he gave himself up to literature, assailed Goethe, and was himself mercilessly attacked by Heine and others. His popular *Geschichte der Deutschen* came out in 1824–25; *Die Geschichte Europas 1789–1814*, in 1853. His strongly monarchical tendencies develop in other histories. He wrote the dramatic fairy tales *Rübezahl* (1829) and *Narcissus* (1830), and an historical novel, *Furore* (1851). *Die deutsche Dichtung von der ältesten bis auf die neueste Zeit* (Stuttgart, 1858–59; 2d ed., 1875) is worthy of mention. His *Deutsche Litteratur* (1828) can be studied in *Specimens of Foreign Literature* (Boston, 1840). Consult also his autobiographical *Denkwürdigkeiten* (Bielefeld, 1876) and R. M. Meyer in *Gestalten und Probleme* (Berlin, 1905).

MENZELINSK, mĕn'tsĕl-ĭnsk'. A town of east Russia in the Government of Ufa, situated on a branch of the Kama, 125 miles northwest of Ufa (Map: Russia, H 3). Important fairs

are held here annually, in which miscellaneous goods are sold approximating the value of $2,000,000. Pop., 1897, 7542; 1910, 8573.

MENZIES, mĕn'zĭz *or* mĕn'yĭz, ALLAN (1845–1916). A Scottish theologian, born in Edinburgh and educated at the universities of Edinburgh and St. Andrews. In 1873 he became minister of Abernyte, Perth, and in 1889 was chosen professor of divinity and biblical criticism in St. Mary's College, St. Andrews. Dr. Menzies, who had studied in Germany, translated into English Baur's *Paul* (1873–75) and *Church History of the First Three Centuries* (1878–79) and Pfleiderer's *Philosophy of Religion* (1886–88). He edited the supplementary series *Ante-Nicene Fathers* (10 vols., 1886–96) and wrote: *National Religion* (1888); *History of Religion* (1895); *The Earliest Gospel* (1901), a study of St. Mark; *Second Corinthians* (1912).

MEPH'ISTOPH'ELES (formerly also *Mephostophilus, Mephostophilis;* of uncertain derivation, perhaps from Gk. μή, *mē*, not + φῶς, *phōs*, light + φίλος, *philos*, loving). A term which appears first in the German *Faustbuch* (1587) as the name of the devil who tempts Faust. The name is perpetuated in Marlowe's play, *Dr. Faustus*. In Goethe's *Faust* he is developed into the scoffing "spirit that denies." The figure comes from the mediæval demonology, but the particular origin or meaning is now lost.

MEP'PEL. A town in the Province of Orenthe, Netherlands, situated on the Meppeler Diep, 16 miles northeast of Zwolle (Map: Netherlands, E 2). It is an important centre for butter, eggs, cattle, and hogs, has calico and canvas manufactures and shipbuilding yards. Pop., 1900, 10,154; 1910, 11,000.

MEQUINEZ, mĕk'ĭ-nĕz, or **MEK'NEZ.** A noted town of Morocco, Africa, situated in a mountainous region 37 miles southwest of Fez (Map: Africa, D 1). It is still one of the finest cities of Morocco, although it has greatly declined since the eighteenth century, when it had attained unusual magnificence under the Sultan Muley Ismail. It is inclosed by a wall, pierced by nine gates, some of which are remarkable for their Moorish tile decorations. It is surrounded by extensive olive groves and has a fine mosque, which is visited by pilgrims, and a palace of the Sultan. It is of little commercial or industrial importance, its chief manufactures being earthenware and leather goods. The population is estimated at from 25,000 to 50,000.

MERAN, mä-rän'. A famous health resort in Tirol, Austria, 1045 feet above the sea, situated on the Passer, about 40 miles south-southwest of Innsbruck (Map: Austria, B 3). It lies at the foot of the Küchelberg and is noted for its salubrious and moderate climate. The vicinity abounds in picturesque old castles, châteaux, and villas, and fine promenades extend along both banks of the Passer. The principal street, Unter den Lauben, flanked with arcades, contains the fifteenth-century burg—the residence (till 1490) of the counts of Tirol and now in its restored condition serving as a museum. The season lasts from the beginning of fall to the end of spring, and the annual number of patients exceeds 10,000. Meran is provided with several churches, schools, a municipal museum, and a theatre. Its institutions include a Benedictine's school and a boarding school for English girls. The château of Lebenberg, south of Meran, is also of no little interest. Meran is first mentioned as Mairania in 857. It manufactures furniture, breadstuffs, gold and silver ware, and does a thriving business in fruit and wine. It became a town at the end of the thirteenth century. Pop., 1900, 9284; 1910, 11,568.

MERAN, AGNES OF. See AGNES OF MERAN.

MERBECK, JOHN. See MARBECK, JOHN.

MERCADANTE, mĕr'kä-dän'tä, FRANCESCO SAVERIO (1797–1870). A celebrated Italian musician, born at Altamura. He studied the violin and the flute under Zingarelli at the Conservatory San Sebastiano at Naples, but soon turned his attention to compositions for the voice. In 1818 he produced a grand cantata, entitled *L' unione delle belli arti*, which was performed at the Teatro Fondo and which met with a very favorable reception. This led to an engagement at the Teatro San Carlo, where his first opera, *L' apoteosi d' Ercole* (1819), was well received. In 1833 he was appointed chapelmaster at the cathedral of Novara, and in 1836 his opera *I briganti* was performed in Paris with an extraordinary cast, which consisted of Rubini, Tamburino, Lablache, and Grisi. He was made director of the royal conservatory at Naples in 1840, but became totally blind in 1862. He composed about 60 operas, 20 masses, and much Church music. He died at Naples.

MERCALLI, mĕr-käl'lê, GIUSEPPE (1850–1914). An Italian geologist. He was born in Milan, entered the Roman Catholic priesthood, and taught natural science at Monzo and Domodossola and in the Milan seminary. He had liberal tendencies and was removed from his chair in Milan when he was so indiscreet as to subscribe publicly to a national monument for Rosmini-Serbati. He then became a teacher in the government's *licei*—first at Reggio di Calabria for three years, then for 23 years at Naples, where he also lectured in the university—and after 1911 was director of the Vesuvius Observatory. He was burned to death by an overturned lamp in his study on March 19, 1914. His early work in northern Italy was on glacial action. He devised a scale (called by his name) for measuring earthquake shocks. More important were his vulcanological studies, first at Etna and then at Vesuvius; his "Notizie Vesuviane" appeared in the *Bolletino* of the Società Sismologica Italiana (1892–1906). His book *I vulcani attivi della terra* (1907) is one of the most valuable general works on volcanoes.

MER'CANTILE AGENCY. "An institution which, for a subscription price, agrees to collect information as to the financial condition and responsibility of business men and to transmit the same to its subscribers." At times it also undertakes the collection of debts for its customers. It originated in the United States, during the period of depression following the panic of 1837, and its avowed object was to uphold, extend, and render safe and profitable to all concerned the great credit system which had grown up with the increase of commerce. The first mercantile agency was established in New York during the year 1841 by Lewis Tappan and was followed the next year by a similar agency under the control of Woodward and Dusenbury.

While originally established for the purpose of answering questions about the financial standing of particular persons, the scope of the agency has been extended, until its records contain the financial ratings of nearly every business man in the country. In addition to the general agencies, such as Dun & Co. and the Bradstreet Company, there are many special agencies which

confine themselves to particular lines of trade. By the general agencies the country is divided into districts, in each of which is a managing agent with various correspondents in the several localities. If a subscriber wishes more minute or more recent information than that contained in the agency's periodical reports, he asks for and receives a special report brought down to date.

While a mercantile agency is employed by its subscribers to do certain things for them, it is not in the strict sense their agent (q.v.) in these transactions; it is rather an independent contractor. It engages to accomplish a stipulated result, but is entirely free to accomplish this in its own way and with its own instrumentalities. If, in obtaining and publishing information, it does a legal wrong to third persons, it is responsible therefor, but its employers are not. A statement made to a subscriber asking for it is generally held to be conditionally privileged, but when made to other subscribers who have no interest in the information it is not privileged. In a case of the former kind the plaintiff would be obliged, therefore, to prove actual malice, or malice in fact, to sustain an action for libel, slander, or the like on the part of the agency; but in the latter case he would not.

A subscriber who is misled to his injury by acting upon false information supplied by the agency is generally entitled to damages against it. Most agencies, however, require their patrons to agree that the agency shall not be responsible for any loss caused by the neglect of any of its servants, clerks, attorneys, or employees in procuring, collecting, and communicating information. Such agreements have been upheld by several courts. If, however, after correct information has been received by the agency, a blunder is made by its managers in printing it, the agency should be held liable, and such a decision was made by the Supreme Court of Pennsylvania. When a business man makes false statements about his financial condition to a mercantile agency, and this is communicated to a third party who acts upon it to his injury, the third party has as good cause of action in deceit (q.v.) against the business man as though the statement had been made directly to him. Consult J. W. Errant, *The Law Relating to Mercantile Agencies* (Philadelphia, 1889), and Reinhard, *A Treatise on the Law of Agency* (Indianapolis, 1902).

MERCANTILE AGENT. In the absence of a statutory definition, specifically one who acts as agent for another in important commercial transactions. It does not include a mere servant, caretaker, or a merchant's clerk or salesman, or a common carrier. The present Factors Act in England (52 and 53 Vict., c. 45, § 1) defines the term as an "agent having in the customary course of his business as such agent authority either to sell goods, or to consign goods for the purpose of sale, or to buy goods, or to raise money in the security of goods." This is the signification in which the term is most frequently used in current law literature. The rights and obligations of such an agent, both with respect to his principal, or employer, and to third parties, are governed by the general law of agency. See AGENT; FACTOR; PRINCIPAL AND AGENT.

MERCANTILE LAW. A term which at present covers a rather indefinite domain in English law. It is ordinarily applied to a group of topics more or less closely related and having this element in common—that they have originated in, or been greatly modified by, the usages and customs of merchants. The legal rules governing these various topics do not form a separate and independent branch of jurisprudence: they cannot be called a distinct and homogeneous body of law. In the leading English treatises on this subject mercantile law is viewed as comprising the law of partnership, joint-stock companies, agency, negotiable paper, contracts with carriers, insurance, sale, bottomry and respondentia, debt, guaranty, stoppage in transitu, lien, and bankruptcy.

Much of the law upon these subjects is of ancient origin, coming to us from the Roman civil law and later codes. For a discussion of this early development, see LAW MERCHANT. For the law upon the various subjects included under the term "mercantile law," such as partnership, lien, etc., see those titles.

MER'CANTILISM. The system of economic policy evolved by the European states after the decay of the feudal system. In essence it represented a transition from local and territorial to national economy. In the earlier period each town had regulated industry in the exclusive interest of its own inhabitants, treating the citizens of other towns as aliens who could trade in the town only after submitting to such restrictions as the town government chose to impose. It was the purpose of the mercantilist statesmen to break down the barriers to internal intercourse and to unite the state in a single economic organism in rivalry with other states.

The practical measures by which the mercantilist statesmen sought to attain national power were: (1) the accumulation within the state of a large amount of the precious metals; (2) the encouragement of agriculture; (3) the development of manufactures; and (4) the creation of a mercantile marine. In the writings of the exponents of mercantilist doctrine especial emphasis was devoted to the acquisition of treasure. The European states were rapidly passing from an economic order in which payments in kind prevailed to an economy based upon money transactions, and as a consequence the great importance of a sufficient stock of the precious metals occupied a large share of the attention of statesmen. In the earlier mercantile period an effort had been made to prevent the exportation of bullion altogether. Later it came to be recognized that bullion sent abroad in the way of exchange might result in an ultimate increase in the stock of bullion at home. Statesmen then concentrated their attention upon securing a favorable balance of trade. It was believed that one way of attaining this end was to encourage the exportation of finished commodities and the importation of raw materials, since in this way, it appeared, a greater value would be exported than imported.

Manufactures were encouraged because they furnished materials for commerce, helping thereby to secure the so-called favorable balance of trade. Agriculture took a subordinate position, but it was held deserving of encouragement as a source of abundance of raw material. The growth of population was desired in order to have an ample supply of cheap labor power. Cheap agricultural products and cheap labor were regarded as objects to be striven for, and herein we see a difference between mercantilism and modern protectionism, the avowed claims of

which are high prices for agricultural as well as other products and high wages for labor. In England the earlier prohibition of exportation of grain, which had been calculated to favor the consumer, was succeeded by prohibition of importation when prices fell below a certain figure, in order that tillage might be uniformly profitable. Manufactures were stimulated by high duties, or even by prohibition of imports, and by numerous sumptuary laws favoring domestic manufactures. The aim here was twofold: to attain national economic independence and to prevent the export of bullion in payment for foreign goods. Finally, the encouragement of shipping was naturally regarded as of the greatest consequence at the time, since the new trade with America and the Orient rapidly enriched the nations which controlled it. For the mercantilist navigation policy, see NAVIGATION LAWS.

Mercantilism as a definite policy first appears in English history at the end of the fourteenth century; not much later it was also the settled policy of France. In England it reached its height under Elizabeth; in France under Colbert in the seventeenth century. From that time pure mercantilism rapidly decayed, degenerating into a complicated system of discriminating duties designed to favor private interests instead of those of the state as a whole. It was mercantilism of this kind against which Adam Smith directed his criticisms, which prejudiced economic writers for a century against the system. Recent historical investigations have, however, demonstrated that at its best mercantilism represented a great advance in economic policy and that it was effective in bringing about national unity and independence. See INTERNATIONAL TRADE; PROTECTION; BALANCE OF TRADE; PHYSIOCRATS; NAVIGATION LAWS.

Bibliography. Perhaps the best presentation of a moderate mercantilism by an advocate is that found in Sir James Steuart's *Inquiry into the Principles of Political Economy* (London, 1767). For the older critical attitude towards mercantilism, consult Adam Smith, *Wealth of Nations*, book iv (New York, 1904). By far the best statement of the modern view is G. Schmoller, *Mercantile System* (Eng. trans., New York, 1896); also F. K. Mann, *Der Marschall Vauban und die Volkswirtschaftslehre des Absolutismus: eine Kritik der Merkantilsystems* (Munich, 1914), containing a bibliography.

MER'CANTILISTS. See POLITICAL ECONOMY.

MERCAP'TANS (from Lat. *mercurius*, mercury, quicksilver + *captans*, pres. p. of *captare*, frequentative of *capere*, to take; so called as absorbing mercury), or THIOALCOHOLS. A class of carbon compounds analogous to the alcohols. The latter are defined as compounds containing one or more OH (hydroxyl) groups directly combined with hydrocarbon groups like methyl (CH_3), ethyl (C_2H_5), etc. Similarly, the mercaptans may be defined as compounds containing one or more SH (sulphur and hydrogen) groups directly combined with hydrocarbon groups. Thus, methyl alcohol has the constitution CH_3OH, methyl mercaptan the constitution CH_3SH; ethyl alcohol has the constitution C_2H_5OH, ethyl mercaptan the constitution C_2H_5SH; etc. The following are the principal methods used in the preparation of mercaptans: (1) by the action of an alcoholic solution of potassium sulphohydrate (KSH) upon halogen derivatives of the hydrocarbons (CH_3Cl, C_2H_5Cl, etc.); (2) by distilling an aqueous solution of potassium sulphohydrate with salts of acids like the well-known ethyl-sulphuric acid; (3) by heating alcohols (or phenols) with the pentasulphide of phosphorus, P_2S_5. Thus methyl mercaptan may be prepared according to either of the following reactions:

$$\text{I.}\quad \underset{\text{Methyl chloride}}{CH_3Cl} + \underset{\text{Potassium sulphohydrate}}{KSH} = \underset{\text{Methyl mercaptan}}{CH_3SH} + \underset{\text{Potassium chloride}}{KCl}$$

$$\text{II.}\quad \underset{\text{Potassium methyl sulphate}}{SO_2\begin{matrix}\diagup OCH_3\\ \diagdown OK\end{matrix}} + KSH = CH^3SH + \underset{\text{Potassium sulphate}}{K^2SO^4}$$

$$\text{III.}\quad \underset{\text{Methyl alcohol}}{5CH_3OH} + P_2S_5 = 5CH_3SH + \underset{\text{Phosphorus pentoxide}}{P_2O_5}$$

Most mercaptans are liquid, though some exist, at ordinary temperatures, in the solid state. The liquid mercaptans are much more volatile than the corresponding alcohols. They are only sparingly soluble in water, but mix freely with alcohol or ether. Their most characteristic property, however, is their exceedingly offensive odor, by which, according to Emil Fischer and Penzoldt, a quantity of ethyl mercaptan can be detected that is 250 times more minute than the smallest amount of sodium that can be revealed by the spectroscope. The hydrogen of the SH group of a mercaptan can be replaced by metals. The resulting substances, called mercaptides, are decomposed by acids, but—unlike the alcoholates (see ALCOHOLS)—they are unaffected by pure water. The ethyl mercaptide of mercury is formed according to the following equation:

$$\underset{\text{Ethyl mercaptan}}{2C_2H_5SH} + \underset{\text{Mercuric oxide}}{HgO} = \underset{\text{Mercuric mercaptide}}{(C_2H_5S)_2Hg} + \underset{\text{Water}}{H_2O}$$

How much more strongly acidic mercaptans are than alcohols may be seen from the fact that mercaptans, in alcoholic solution, are capable of taking metals away from their acetates and forming, of course, the corresponding mercaptides. The first mercaptan ever prepared was ethyl mercaptan, which was obtained by Zeise in 1833. It is now extensively used in the manufacture of sulphonal (q.v.), a well-known hypnotic.

MERCAP'TIDES. See MERCAPTANS.

MERCA'TOR, GERARDUS (Latinized form of GERHARD KREMER) (1512–94). A Flemish mathematician and geographer, born in Rupelmonde. He took his degree in philosophy at the University of Louvain and later made a profound study of the sciences of geography and mathematics. In 1534 he opened a geographical shop in Louvain and did much work for Emperor Charles V during his campaigns. In 1552 he moved to Duisburg, where in 1559 he was appointed cosmographer to the Duke of Jülich and Cleves. His name is perpetuated by the projection used in nautical maps, in which the meridians are represented by parallel lines, and parallels of latitude by straight lines intersecting the meridians at right angles. The projection, however, seems to have been applied to nautical maps by Edward Wright. Besides a large number of maps, Mercator compiled series of geographical tables, *Nova et Aucta Orbis Terræ Descriptio ad Usum Navigantium* (1569) and *Tabulæ Geographicæ ad Mentem Ptolemæi Restitutæ* (1578). He also wrote a *Harmonia*

Evangeliorum (1592), but his chief work is *Atlas, sive Cosmographicæ Meditationes de Fabrica Mundi et Fabricati Figura* (1594)—the maps were engraved by himself. This atlas was placed on the Index Expurgatorius.

MERCATOR (real name KAUFMANN), NICOLAUS (c.1620–87). A German mathematician, astronomer, and engineer, born at Cismar in the Duchy of Holstein. He was educated at the universities of Copenhagen and Rostock, and in 1660 or thereabouts went to London, where he became one of the first members of the Royal Society, then newly founded. Subsequently he proceeded to France, where he was appointed hydraulic engineer to direct the construction of the Versailles fountains. Owing to his refusal to accept the Roman Catholic faith, the sum agreed upon as payment for this work was withheld, and this fact is said to have hastened his death. He is credited with the discovery of several methods of calculation, in astronomy and higher mathematics. The most important one is the series for log $(1 + x)$. His publications include, besides contributions to the *Philosophical Transactions* of the Royal Society, *Cosmographia* (1651); *Astronomia Sphærica* (1651); *Rationes Mathematicæ Subductæ* (1653); *Logarithmotechnia* (1668–74); *Institutionum Astronomicarum, Libri Duo* (1876). Consult Kaestner, *Geschichte der Mathematik* (Göttingen, 1796–1800), and Montucla, *Histoire des mathématiques* (Paris, 1799–1802).

MERCATOR'S PROJECTION. See CHART; MAP; MERCATOR, GERARDUS; NAVIGATION; SAILINGS.

MERCED, mĕr-sĕd′. A city and the county seat of Merced Co., Cal., 151 miles by rail southeast of San Francisco, on the Southern Pacific, the Atchison, Topeka, and Santa Fe, and the Yosemite Valley railroads, and near the San Joaquin and Merced rivers (Map: California, E 5). It contains the county hospital, a public library, a sanitarium, and a fine courthouse. Fruit growing, stock raising, farming, and dairying constitute the chief industries. Pop., 1900, 1969; 1910, 3102.

MERCEDES, mĕr-sā′dȧs. A town in the Province of Buenos Aires, Argentina, situated on the Pacific Railroad, 36 miles west of Buenos Aires (Map: Argentina, G 4). It is a flourishing town in a rich sheep-raising region, has a normal school, a public library, and several steam mills and soap factories. Pop. (est.), 50,000. It was founded as a military station in 1779 and has been settled largely by Irish immigrants.

MER′CENARIES (Lat. *mercenarius*, hireling, from *merces*, wages, from *merere*, to gain, deserve; connected with Gk. *μείρεσθαι*, *meiresthai*, to share, divide). Hired soldiers, usually foreigners in the country for which they fight. They have been employed from the earliest times. In the early Greek republics there was no standing army or mercenary force, but the citizens themselves formed a national militia. In Persia, however, there were large numbers of Greek mercenaries, and they appear to have played the same part which in later centuries the Swiss did in western Europe. The first Grecian state which used mercenaries in large numbers was Athens, and other Greek states soon followed this example, so that by the end of the Peloponnesian War there were a large number of men in Greece whose profession was war and who fought regardless of the cause. In Rome mercenary troops were long used merely as auxiliaries, but about the fourth century A.D. the army began to assume the characteristics of a mercenary force, being composed largely of Germans, who finally overthrew the Western Empire. In the Byzantine Empire nearly all the troops were mercenaries.

But the golden age of mercenaries was in western Europe during the Middle Ages and the beginning of the modern era. In the early Middle Ages armies were recruited by a feudal levy, but when wars came to be waged on a larger scale in the twelfth century, the 40 days per year which the vassal had to serve proved insufficient, and instead the King or feudal lord began to commute the service of the vassal for a money payment and hire soldiers. In England itself, mercenaries were rare, though they did form one of the grievances against John and Henry III. On the Continent circumstances were different, and kings with a wide and scattered empire, like Henry II of England, who possessed a large part of France, were compelled to employ mercenaries of all kinds. At first it was common to buy their services by a gift of land, but by the twelfth century money became more common, and Norman knights, Genoese bowmen, and Flemish pikemen were frequently hired for pay. A fuller development was reached in the thirteenth century by the appearance of the condottiere system, in which some noted chief collected an army of free companions and sold his force as a whole. The first of these was Roger de Flor, who waged war successfully against the Byzantine Emperor Andronicus II. (See CATALAN GRAND COMPANY.) It was to this type that the various noted Italian adventurers belonged. The character of Italian civilization was of a kind to give impetus to the rise of a mercenary force, for the inhabitants of the many commercial city-states were unwarlike and at the same time frequently engaged in warfare. At times, however, the mercenaries turned their arms against the city which had hired them, or aided in imposing a tyrant upon the city, who then rewarded the company from the spoils. Thus arose in Milan the rule of the Visconti, in Verona that of the Scala, in Ferrara that of the Este, in Rimini that of the Malatesta. At the end of the fourteenth century the Italian mercenary met a dangerous rival in the Swiss pikeman. Switzerland was too small and poor to support all of its hardy sons, and they were sold in large numbers, usually by the canton itself, to some warlike prince. After the battle of Melegnano in 1515 they formed a valuable contingent in the French armies until the French Revolution. All parties in the Thirty Years' War used mercenaries to the exclusion of nearly all other troops, and to this fact is partly due the terrible devastation which was caused. In the American Revolution Great Britain used Hessian mercenaries to fight against the colonists, it being common for some of the smaller princes to sell their subjects in this fashion. The use of mercenaries on the Continent ended with the French Revolution, their place being taken by national standing armies. See BRABANÇONS; CONDOTTIERI; FREE LANCE; SWISS GUARD.

MER′CER, FORT. See FORT MERCER.

MERCER, HENRY CHAPMAN (1856–). An American anthropologist and archæologist, born at Doylestown, Pa., and educated at Harvard, where he graduated in 1879. He made

special studies of the relations of extinct animals to primeval man in North America, especially in connection with the mylodon, peccary, and sloth; made valuable discoveries of fossil carnivora in the Port Kennedy (Pa.) bone cave; and explored the caverns of Yucatan. After research on the Pennsylvania Dutch pottery manufactures he perfected a preparation for mural tiles in 1899; invented in 1902 a new process for making mosaics; and patented a system of printing large designs on paper and fabrics in 1904. He wrote: *Lenape Stone* (1885); *Hill Caves of Yucatan* (1896); *Researches upon the Antiquity of Man in the Delaware Valley and the Eastern United States* (1897); *Tools of the Nation Maker* (1897).

MERCER, Hugh (1720–77). An American soldier. He was born at Aberdeen, Scotland; was educated at the university there; entered the medical profession and served as assistant surgeon under Prince Charles Edward in 1745; emigrated to America in 1747 and settled as a physician near the site of the present Mercersburg, Pa. He served as captain under Braddock in 1755 and was severely wounded in the battle near Fort Duquesne. In 1758 he was promoted to be lieutenant colonel, accompanied General Forbes to Fort Duquesne, now Pittsburgh, and commanded that post for some time. Afterward he settled at Fredericksburg, Va., and on the approach of the Revolution took sides with the Patriot party. He organized and drilled the militia of Virginia in 1775 and the minutemen in 1776, and at Washington's request on June 5, 1776, was made a brigadier general by Congress. He commanded a column in the attack on Trenton and led the advance in the night march on Princeton, which he had himself advised. While rallying his temporarily disorganized troops early in the engagement at Princeton he was mortally wounded, and on January 12 he died in a neighboring farmhouse. A monument to his memory was erected at Laurel Hill Cemetery, Philadelphia, in 1840.

MER'CERIZED COTTON. Cotton that has been treated by a chemical process which imparts a permanent silky lustre to the fabric, yarn, or thread. In 1844 John Mercer, an English chemist, discovered that caustic soda or caustic potash had a remarkable effect upon the cellulose structure of the cotton fibre, changing its physical and chemical nature, causing it to shrink and become thicker and softer, and increasing its affinity for dyes. Mercer took out patents in 1850, but no practical use was made of the discovery because the process shrunk the material so badly. In 1889 Lowe in Great Britain, and later in 1895 Thomas and Prevost, discovered that by treating the cloth under tension the shrinking was obviated and the material assumed, after being washed, a glossy appearance, like silk; but the former's patent was allowed to lapse, while that of the latter inventors was annulled. The lustring effect is, of course, now the most important object in the process. This effect is due to the changed structure of the fibres, which, under the action of the mercerizing treatment while under tension, become straight translucent tubes with a small round central opening instead of the spiral collapsed and flattened tube of the cotton fibre. The lustre is due to the fact that the surface becomes smooth and reflects light like the silk fibre. Mercerizing is now effected by machine processes. There are machines which treat the yarn in hanks, those that treat the cloth, and those that are adapted for either. There are many forms of these machines in which yarn or cloth are treated in the lye, then, if desired, stretched as in a stretching machine with adjoining means of washing. By treating with acids it is further possible to imitate the scroop or viscous hardness supposed to be an essential mark of true silk, but which in reality in the case of silk is due to an artificial process also. Consult Paul Gardner, *Die Mercerization der Baumwolle und die Appretur du Mercerisierten Gewehe* (2d ed., Berlin, 1912), and Murphy, *The Textile Industries*, vol. vii (London, 1912).

MER'CERSBURG. A borough in Franklin Co., Pa., 73 miles by rail southwest of Harrisburg, on a branch of the Cumberland Valley Railroad (Map: Pennsylvania, F 8). It was formerly a noted educational centre as the seat of institutions under the control of the Reformed church in the United States (German). Mercersburg Academy is located here. The principal interests are agriculture and leather manufacture. Mercersburg, originally called Black Town, was incorporated first in 1831. It was the birthplace of President James Buchanan. Pop., 1900, 956; 1910, 1410.

MERCERSBURG THEOLOGY. The name of a system of views emanating from the theological seminary of the German Reformed church formerly located at Mercersburg, Pa. (now at Lancaster), and chiefly defended by Prof. J. W. Nevin (q.v.). He insisted upon the true unity of the person of Christ and the genuinely human character of his life. The person of Christ was made central in the system. Christ is united with generic humanity, which develops itself by an inward force in the Church. Thus, the Church has a true theanthropic character. Emphasis was also laid upon the objective operation of the sacraments. Consult Nevin's principal work, *Mystical Presence* (Philadelphia, 1846), and his *Life* by Theodore Appel (ib., 1889).

MERCER UNIVERSITY. A Baptist university at Macon, Ga., founded in 1838. In 1914–15 it had a faculty of 21 and a student enrollment of 224 in the College of Liberal Arts, 85 in the Law Department, and 39 in Pharmacy. The library contained 20,000 volumes. Its endowment was $400,000 and its income $28,000. The grounds and buildings were valued at $265,000.

MER'CHANT, Francis Walter (1855–). A Canadian educator, born at Oil Springs, Ontario, and educated at Albert and Toronto universities, taking a degree in pedagogy at the latter institution in 1901. For several years he was a successful teacher in various high schools and collegiate institutes and was a lecturer in physics in Western University and College, London, Ontario. He was principal of the London (Ontario) Normal School (1900–08), chief inspector of public and separate schools and inspector of normal schools for Ontario (1908–11), and in 1911 was appointed Director of Industrial and Technical Education for Ontario. Several educational textbooks were prepared by him. He was appointed a senator of Knox College, Toronto, and was elected president of the Ontario Educational Association (1910).

MER'CHANT, Law. See Law Merchant.

MER'CHANTABLE ARTICLE. In the law of sale, an article that is salable in the market

under the name or description which it bears in the contract relating to it. Frequently a contract of sale expressly provides that the article to be delivered shall be merchantable; but even in the absence of such a statement a contract for the sale of goods by description, as for the sale of sugar or wheat or coal, implies an undertaking by the seller to supply an article which comes up to the merchantable standard. The buyer is not entitled to a perfect article, but he is entitled to one that is salable under its contract name. If the contract is for a quantity of Manila sugar, the buyer cannot insist upon absolutely pure sugar, but he can reject sugar that is adulterated to such an extent as not to pass in market as salable Manila sugar. Where the term "merchantable" is used in the contract, either party may show that it bears a peculiar meaning in the trade or in the locality in which the contract is made or to which it relates. See SALE.

MERCHANT MARINE, FOREIGN. See SHIP; SHIPPING.

MERCHANT MARINE OF THE UNITED STATES. The 13 Colonies which eventually became the United States lay along the seaboard, and the shipping interests constituted a large part of their commercial activities. In nearly all the Colonies, from the very first, shipbuilding had been encouraged, and in most of them it was a favored and protected industry. Notwithstanding the demand for men in their numerous wars with the Indians, French, and Spaniards, in many Colonies shipwrights were exempt from military service, and inducements were offered to ship carpenters in England to become colonists. A century before the Revolution shipbuilding in the northern Colonies had become one of the most important—in some the most important—of industrial occupations, and American-built ships were beginning to be sold in England. The unlimited supply and comparative cheapness of shipbuilding timber in the Colonies and its scarcity and higher cost in England caused the sales to British shipowners to increase so rapidly as to provoke resentment and protest from British shipbuilders as early as 1725. It is stated that in the seventeenth century the cost of American vessels ($20 to $40 per ton, depending upon the materials used) was 25 to 50 per cent less than that of similar ships built in England. In 1769, 389 were built of a total tonnage of 20,000. New Hampshire built 45, Massachusetts 137, Rhode Island 39, Connecticut 50, New York 19, New Jersey 4, Pennsylvania 22, Maryland 20, Virginia 27, North Carolina 12, South Carolina 12, Georgia 2. In each succeeding year the amount of new tonnage increased, reaching 26,544 in 1772. In 1775 it was estimated that one-third the ships flying the British flag were American-built.

The British Navigation Acts of 1651, 1660, 1661, and 1663 were chiefly designed to destroy the carrying trade of the Dutch between Great Britain and her Colonies and other countries. But, with the exception of the Act of 1651, they were also planned to curb the expansion of Colonial commerce and shipping, which were becoming so extensive as to excite the fears and opposition of British shipowners and politicians. The Act of 1661 enumerated the Colonial products which could not be lawfully transported in any except British ships bound to England, and the proclamation of 1663 declared that "no commodity of the growth, production, or manufacture of Europe shall be imported into the British plantations but such as are laden and put on board in England, Wales, or Berwick-on-Tweed, and in English-built shipping whereof the master and three-fourths the crew are English." This limited the Colonial commerce with Europe to direct trade with England. As this was chiefly in New England vessels, the other Colonies—especially those of the extreme south—were not greatly concerned. In 1733 an Act of Parliament was passed for the purpose of stopping, by means of prohibitory duties, the trade between the continental colonies and the West India colonies of the French and Dutch. The traffic was important and profitable, so that this Act, as well as those of 1660, 1661, and 1663, was largely evaded by false clearances, smuggling, and other means. For nearly 30 years little was done to check these evasions, but in 1761–63 stringent measures were taken to enforce all the navigation acts with unsparing rigor. The number of customs officers was increased, confiscation usually followed search, and appeal was even more costly than confiscation. These proceedings were strenuously opposed by the colonists and were among the most important causes of the discontent which led to the Revolution. Notwithstanding these and other restrictive acts, the ships and mariners of the Colonies increased in number until, at the breaking out of the Revolution, Massachusetts owned one seagoing vessel for every 100 of her inhabitants; while in New Hampshire, and what is now Maine, more people were engaged in shipbuilding and navigation than in agriculture.

During the War of the Revolution, though the poverty of the Colonies prevented them from building a large number of men-of-war, the extensive merchant fleet furnished a host of privateers, and these small craft captured or destroyed several times as many of the enemy's ships as did the war vessels. In none of the previous wars—with France or Spain—had the British merchant fleet suffered so greatly, the total captures (including vessels and cargoes destroyed) reaching £4,000,000. In 1781 the number of privateers was 449, mounting in all 6735 guns. They cruised in the Channel and in the Irish Sea and captured prizes almost in the entrance to the British ports, raising insurance and freight rates enormously and seriously interfering with all kinds of British commerce. On the other hand 900 American vessels, valued at £1,808,000, were captured previous to 1779.

The American merchant vessels of the pre-Revolutionary period were small, mostly of less than 100 tons. While somewhat slow and unhandy from a modern point of view, they were by no means the awkward, clumsy, and almost unseaworthy vessels of the *Mayflower's* day. The ridiculously high structures on the poop and forecastle of ships of her date had been cut down until the form was not unlike that of sailing vessels of the present time. Sixty years before the outbreak of the war Capt. Andrew Robinson, of Gloucester, built a vessel of two masts with fore-and-aft sails on gaffs and booms, fitted with a jib boom and carrying a jib. This was a schooner, the most useful sailing type ever devised and now the most numerous. At first schooners were very small—50 tons or less—and when they began to grow in size the larger ones were fitted with yards on the foremast to carry a square topsail, or a topsail and topgallant sail. These vessels were called top-

sail schooners and were the craft which served so successfully as privateers and in the navy.

At the close of the Revolution the commerce of the States was well-nigh destroyed, and the poverty of the people made recovery slow. Nevertheless the immediate increase in shipping was considerable. Before the war Great Britain had seriously hampered the trade with her West India colonies; now she interdicted it. But the islands themselves suffered even more. Between 1780 and 1787 it is said that 15,000 slaves died there of starvation because American ships no longer brought dried fish and corn, while several of their own crops were reduced or destroyed by hurricanes.

As already noted, the cost of ship construction in America was considerably less than in England, and the building of ships for English purchasers had been an important industry. This also was cut off as a result of the war by the Orders in Council of the British government, which forbade the purchase or importation of American-built ships. The loss of the West India business drove the hardy navigators further afield. Trade with England was difficult for several years. A lucrative one with the south of Europe sprang up and was growing rapidly when the Barbary Powers discovered that many ships were to be found within striking distance that belonged to a young country which had no navy to protect its merchantmen. In their attack upon it they were openly supported by the British government and British shipowners. Lord Sheffield said that the Barbary pirates, preying on the defenseless commerce of the United States, were a blessing to Great Britain, while Franklin wrote that London merchants had publicly declared that if no Algiers existed it would pay them to build one. Congress was unable to protect the shipping against any foes and the vessels were, for a time, diverted elsewhere. Of those which persisted in trading with the south of Europe several were seized by the Barbary pirates and their crews forced into slavery.

Some adventurous mariners sailed for China, others doubled Cape Horn, seeking the isles of the Pacific or the western coast of the North American continent. Two of these in 1787 were the *Columbia* and *Lady Washington*, which made the first voyage to Oregon.

British ships endeavored to control the trade with the United States, and the British government continued so hostile that many of the States retaliated, exacting double duty on goods imported in British vessels and improvising various taxes of other sorts. But other States did not do this, and they got the business, transshipping the goods in their own coasting craft. In addition to interfering with legitimate trade by exorbitant tonnage and taxation charges, seizing and confiscating ships and cargoes upon flimsy charges, and forbidding trade with its Colonies, the British government authorized and encouraged rigorous search of American vessels and impressment of seamen. Little attention was paid to evidence of nationality if the need for men was urgent. Thousands of American citizens were thus seized and compelled to serve in the British navy.

The lack of support by the government and the difficulties and enemies to be met had held down American commerce, so that in 1789 the entire merchant tonnage registered for foreign trade was but 123,893. Among the first Acts of the new Congress were several for the relief of shipping. This was largely brought about by urgent appeals from merchants and shipowners, especially those of Baltimore. Madison brought in the bill for the revenue tariff, and this provided for a reduction of 10 per cent of the duty on all goods imported in American ships. Specially heavy taxes were laid on tea imported in other than American bottoms, or even on tea imported in them if brought from any place in Europe. The tonnage bill laid a tax of six cents per ton on American-built ships if owned by Americans and 30 cents per ton if owned by foreigners, while foreign-built and foreign-owned ships paid 50 cents. All ships were in theory admitted to the coasting trade, but as foreign ships paid the tax every time they entered port, and American ships only paid it once a year, the prohibition was nearly absolute.

The effect of this protective legislation was instantaneous. The registered tonnage for foreign trade increased from 123,893 in 1789 to 346,254 in 1790; 363,110 in 1791; 411,438 in 1792; 367,734 in 1793; and 438,863 in 1794. The percentage of imports carried in American bottoms was: 1789, 17.5 per cent; 1790, 41; 1791, 58; 1792, 67; 1793, 82; 1794, 91. The drop in tonnage in 1793 was due in part to the depredations of the Dey of Algiers. To punish this pirate and prevent future aggressions of a similar nature Congress, upon Washington's urgent recommendation, authorized the building of six frigates and the establishment of a permanent naval force. But before these ships were completed a treaty was arranged with the Dey in which he was to receive about $1,000,000 and other presents, including a frigate superior to any vessel ever under the United States flag up to that time. Congress, with careful economy, at once reduced the number of frigates to three and sold the material gathered for the others.

And now a new enemy appeared. The Revolution in France drove the former friends of the United States from power. The semblance of government under the Reign of Terror permitted all things. When the government of the United States refused to allow itself to be embroiled with England by permitting its territory to be used for unfriendly purposes, the attitude of the French changed. In the West Indies their picaroons (privateers) frequently seized American vessels without cause. After the diplomatic disputes began, these actions were not only permitted, but encouraged. Jealousy of the active mercantile navy of the United States, hatred of England and of their trade with the English colonies, restricted though it was, all combined to bring what remained of American West India trade to ruin. In 1794, 38 American vessels were seized upon the high seas by French warships and privateers and carried into French ports for confiscation. In the following years the conditions were as bad or worse. Protests were of no avail. The government under which the seizures took place was usually out of office by the time the protests were made and the documents in the cases submitted. Acting upon Washington's suggestions, Congress authorized the building of additional warships and the purchase of merchant vessels suitable for carrying an armament. In April, 1798, the Navy Department was organized, and in July, United States cruisers were directed to

capture any French vessels which might be found interfering with American commerce. After three years of fighting without the declaration of war, the French were so severely punished as to be glad to negotiate on any terms, and their harassment of American shipping ceased.

While still at war with France the United States escaped hostilities with the Dey of Algiers by giving way to his pretensions and by fortunate diplomatic negotiations with Turkey. Lack of a naval force for so many years, and the consequent failure to defend American citizens and property, led to a whole crop of small wars with the Barbary states. Gifts to Algiers and failure to punish the Dey for the imprisonment of American citizens and for depredations upon American commerce led the other Barbary Powers to adopt similar tactics. The Pasha of Tripoli declared war in May, 1801, but before the merchant marine had suffered to any degree a strong American squadron appeared before Tripoli, Tunis, and Algiers. Tripoli continued to make war, but Tunis and Algiers were quieted. Eventually the Tripolitans were thoroughly beaten and punished, and the Bey of Tunis overawed and compelled to sign a satisfactory treaty.

American dealings with England and France were equally unsatisfactory. The former continued to oppress the merchant marine by unfair taxes, impressment of seamen, and interference with trade. The latter did all she could to punish American ships for submitting to English methods. At this time all Europe was at war. The United States was the only neutral of importance, and the carrying trade of Europe was in its hands. Had the government stood firmly for its rights, much trouble might have been avoided. But President Jefferson was for peace at any price and merely protested against the imprisonment and impressment of thousands of American citizens and the confiscation of millions of dollars' worth of American ships and cargoes. England repeatedly refused to negotiate concerning or consider the question of impressment, although proof was presented that, in 1806–07, 6000 American seamen were serving against their will in the British navy.

Great Britain declared blockades of the French and other coasts and of the West India islands of her foes. France replied with declarations of blockade of the British Isles and colonies. These were only "paper" blockades, but served as an excuse to seize and confiscate American vessels. A British Order in Council forbade neutral vessels from carrying any goods from any port in the possession of France or her allies to any other similar port. Napoleon replied by his Milan Decree, directing the confiscation of all neutral ships which accepted British protection and paid British duties. In addition a British royal proclamation required royal officers to enforce the "right" of impressment against neutral merchant ships. Nor was this arrogance confined to merchant ships. In 1807 the British 50-gun ship *Leopard* held up the United States frigate *Chesapeake* and forcibly removed several of her crew.

To resist these aggressions, President Jefferson and the congressional majority adopted the policy of embargo. This is estimated to have cost the country $100,000,000 in 15 months, nearly destroyed its commerce, and was an indirect cause of the War of 1812.

Notwithstanding all the dangers and difficulties that beset American commerce, it throve because the prizes of success were large, so that the year 1810 saw the high-water mark of the foreign trade, the registered tonnage reaching 981,019. Madison was now President, and he was less inclined than Jefferson to submit to the condition of affairs. The temper of the people had also become aroused, and as the British continued their policy towards neutrals, war was becoming inevitable. British frigates lay outside of Sandy Hook, searching each merchant ship as she came out, impressing members of the crew, and seizing the vessel and cargo if she were bound to French ports in Europe or her colonies or to ports of her allies. Madison sent Commodore John Rodgers in the frigate *President* to watch this blockade of a neutral port. During the evening of May 16, 1811, Rodgers spoke a ship of war which, in the darkness, he took to be the British frigate *Guerrière*. When hailed the stranger returned an evasive reply and a round shot which lodged in the *President's* mainmast. The *President* replied by a broadside, and the fighting continued until the fire of the British ship was silenced. The stranger was then found to be the sloop of war *Little Belt*.

British aggressions were not checked by this incident. Seeing that war was imminent, President Madison laid a new embargo upon American ships and sent a warning to those abroad. The war which ensued was forced upon the United States and only resorted to when the conditions became intolerable. But the country was wretchedly unprepared. The work of the navy, however, raised its prestige enormously, and the privateers were not far behind in the brilliance of their achievements. They numbered 517 and carried 2893 guns. During the period of hostilities they captured or destroyed 1300 prizes valued at $39,000,000. Being lightly gunned, heavily sparred, and of fine model, they were very fast and enormously efficient as commerce destroyers, but they were not simply vampires seeking dollars and safety. Many of them never refused combat on reasonably even terms either with privateers of the enemy or with his regular cruisers, and a number of the latter were among the prizes taken. As in the Revolution, they sought the coasts of England and made British commerce so precarious a business that marine insurance reached very high figures and British protests against the inefficiency of the navy in not preventing their operations were frequent and bitter. Their success, indeed, formed the principal reason why Great Britain was so willing the war should end.

In the Treaty of Ghent no mention was made of impressment, but it was never again attempted, so that the merchant service justly felt that it had fought for and won its own battle for sailors' rights.

During the war the registered tonnage in the foreign trade of course decreased very materially, and of the vessels registered many never went to sea. According to the Treasury reports the tonnage in 1815 was 854,295; in 1816, 800,760; in 1817, 804,851; in 1818, 589,954; in 1819, 581,230. The figures for 1815, 1816, and 1817 are incorrect and include many vessels missing since the war—lost, captured, sunk, broken up, or diverted to the coastwise trade; and the drop in each year, especially in 1818,

is due to their removal from the customhouse lists. The actual size of the mercantile fleet in these years is unknown, but there is every reason to believe that the tonnage of existing vessels was about 500,000 in 1815 and that it increased steadily up to the figures of 1818–19. The increase continued thereafter, though the total did not reach the high figures of 1810 until 30 years after the war closed. This was in no way discreditable to the energy of American merchants or sailors. Conditions had changed. The European wars were over, so that American ships were no longer harried, confiscated, or destroyed. On the other hand all maritime Europe was met in competition. Of course it took time for the foreign mercantile marines to rebuild their vessels and get possession of the trade they had lost. American statesmen, without duly considering the causes which had built up their great ocean fleet, or the reasons why it did not succumb when so bitterly assailed, firmly believed that the flourishing condition of the merchant carrying trade was due almost entirely to Yankee enterprise and ingenuity, so at the close of the war they offered to make treaties with all nations in which the preferential duties allowed upon goods imported in American ships would be given up provided similar import and export duties be not laid, or if laid be given up, by the other contracting Power. Great Britain seized the opportunity at once, but she was followed by Sweden and Algiers only. In the convention with Great Britain she stipulated that she should regulate the trade of her West Indian and Canadian colonies as she might desire. The removal of the discriminating duty was not immediately harmful. England was too busy readjusting and extending her trade in Europe, where she had less active opponents to contend with. The loss of Canadian and West Indian business was a blow and caused 80,000 tons of American shipping to be laid up. In a very short time Great Britain's purpose was evidently to exclude American vessels, in which she succeeded admirably, partly by direct and partly by indirect means. Congress soon realized the unfair conditions and passed an act forbidding the entrance of vessels of any nation from ports from which American vessels were excluded. This eventually brought Great Britain to improved terms, but in the meantime it caused enormous losses to all concerned. Another section of the Act of 1817 barred foreign vessels from the coasting trade. This was perhaps unnecessary, as tonnage duties had already effected this.

As the foreign carrying trade which did not enter American ports was reabsorbed by the vessels of the nations concerned, the American ships forced out of this traffic entered the coasting trade or the direct carriage between American and foreign ports. At the same time the total foreign commerce of the United States decreased quite steadily from 1816 to 1830, with a slight temporary rise in 1825. This decrease of business in the face of a growing tonnage gave an increasing surplus of American ships, so that the percentage of imports and exports carried in American bottoms naturally also increased until, in 1826, it reached 92.5. This high percentage of goods carried to and from the ports of the United States, and the apparent prosperity wrought by unusual and temporary conditions, blinded the eyes of American statesmen to the actual conditions. One of the causes of the maintenance of the high percentage was the establishment, immediately after the war, of numerous lines of sailing packets between the United States and Europe, especially England. The first and greatest of these was the celebrated Black Ball line, but the vessels in all the lines were of such excellence that, until the advent of steam in this trade, few foreign vessels were able to compete.

In 1828 the last vestige of protection was removed from the foreign trade. The Act of 1815 had offered the removal of tonnage duties in the direct trade with other countries. The Act of 1828 removed them also in the indirect trade. The reciprocity treaties, 30 or 40 in number, which were negotiated under these Acts are still in existence or their terms have been repeated in later conventions. The effect of the Act of 1828 was apparently instantaneous and reflected in the tonnage figures. In that year the registered tonnage was 757,998; in 1829, 592,859; in 1830, 537,563. But these figures are deceptive. In 1829 the sharp fall in registered tonnage was partly caused by the removal from registry of a considerable number of vessels no longer in existence, but whose names still appeared on the customhouse lists. Notwithstanding the removal of protection, the low cost of wooden shipbuilding in the United States and the high efficiency of operation gave the merchant fleet a fair degree of prosperity for some years longer. Probably 1836 may be regarded as the high-water mark, if registered tonnage, value of foreign commerce, and percentage carried in American bottoms are all considered. Foreign competition then began to make itself felt.

In the development of ocean trade and shipping a factor of the greatest importance had appeared some time before, and its effect was now rapidly increasing. This was steam. It received early and wide use on the coast and inland waters and diverted attention from deep-sea affairs. About 1830 railroads began operations. Steam on land and water was so profitably used in the internal development of the country, and the demand for capital for this purpose was so incessant, that each ocean-trade undertaking was dropped as soon as it became definitely unprofitable, no matter what its possibilities were thought to be.

Though the first steam vessel to cross the Atlantic, the *Savannah*, was an American ship, the first to undertake regular passages were the British steamers *Sirius* and *Great Western* in 1838. Up to this time the great American sailing-packet lines had a monopoly of the trade. Great Britain saw her opportunity, and when, late in 1838, Samuel Cunard made his final proposals to the British government they were accepted. The subsidy given to the Cunard Company was at first $425,000 per annum, and this was about 25 per cent of its gross operating expenses. It was paid to insure the establishment of transatlantic steam navigation firmly in English hands, and it succeeded. As the service (originally planned for Halifax and Boston) expanded and extended to New York the subsidy was increased at intervals until it reached $850,000. The American sailing packets continued to run, many of them until the Civil War, but in decreasing numbers and with diminishing profits. No American steamer line was started because Congress would grant no

subsidy, and a steamship line could not exist without it.

Mr. Wheelwright, American Consul at Guayaquil, realizing the importance of a steam line to the west coast of South America, endeavored to get a subsidy from Congress for it, but failed, although supported by American shipping merchants. He then went to England, met a cordial reception, secured an ample subsidy from the government, built a fleet of ships after the American model, and thus started the Pacific Steam Navigation Company, now one of the greatest of steamship companies and the greatest cause of the extension of British trade in South America. The trade of the West Indies, Spanish Main, and Brazil was such as to require a steamship line for its development. A subsidy was offered and the Royal Mail West India Company was organized. When its subsidy proved insufficient, the required service was reduced. Later increased service was called for and the subsidy augmented. France and other nations followed England's lead, the United States government alone standing out against subsidy.

Finally in 1845 Congress authorized the Postmaster-General to make contracts with the owners of American vessels for the regular transportation of the United States mails. The first contract was made with the Ocean Steamship Company for a service to Havre and Bremen. The company were to receive $200,000 for 20 trips—about half as much as the amount paid the Cunard line for a much shorter route. Two very fine ships were built in 1847, the *Washington* (1640 tons) and the *Hermann* (1734 tons), and in 1850 these were followed by two of 2400 and 2850 tons. In 1847 the Black Ball line built a 2000-ton steamer, the *United States*, and she made several voyages; but without a subsidy she was a losing venture and was soon withdrawn and sold.

About the same time contracts were made for steamer lines to the West Indies, Isthmus of Panama, and, on the Pacific coast, from Panama north. The first of these was the Law line (afterward the Pacific Mail Steamship Company), which sent steamers to the Pacific and connected with its Atlantic branch at the Isthmus of Panama. Owing to the discovery of gold in California and the consequent increase of trade, this company became very prosperous and its fleet grew with rapidity. The transpacific service was not established until 1867 and was never really profitable.

In 1847 the Collins line of five steamers was projected. The original subsidy offered was small, but for increased service, larger vessels (the number reduced to four), and a higher rate of speed the subsidy was increased to $33,000 per voyage or $858,000 yearly for 26 voyages. These vessels, which began service in 1850, were much the largest, finest, and fastest vessels on the Atlantic. Such characteristics made them popular, but the cost and speed rendered them so expensive to run that the company made no money. However, they broke the British steamship monopoly, cut down the time of passage from 12 to less than 10 days, and reduced the cost of steamship freight between New York and Liverpool from $37 to $20 per ton. The company was unfortunate. The *Arctic* was sunk in collision, and the *Pacific* was lost at sea. A new and larger steamer was built in 1855, but in the same year Congress repealed the Mail Subsidy Act, and the company necessarily suspended operations.

The famous clipper ship (q.v.) was the natural result of the introduction of steam into ocean navigation. It was the last expiring effort of the sailing ship to hold its own with the steamer on long voyages by nearly equaling its speed and at the same time affording a lower freight rate. The ship which has the reputation of being the first of the type was the *Rainbow*, built at Baltimore in 1843. The necessity for speed to compete with steam in the transatlantic trade; the desirability of speed as a saver of time in the long voyage to China; the discovery of gold in California, with the corresponding increase of trade between the east and west coasts of the country; and lastly the European demand for transportation during the Crimean War all combined to popularize the clipper, extend for the moment the career of the sailing ship, and also to sustain for several years (and even increase) the tonnage of American foreign trade.

As the various supporting factors of this tonnage were reduced or extinguished the direct opposition increased. Iron began to supersede wood for steam vessels, and the shipbuilding yards and ironworks of the country were not prepared to build hulls of that material at a rate to compete with British establishments. The iron-hulled freight steamer then began to supplant the wooden sailing ship. The Civil War was now imminent, and all that sectional hatred and bias could do to injure the property that was almost wholly Northern was done. Nevertheless the registered tonnage, including the deep-sea fisheries (182,106), whale fishery (145,734), and a large amount of small craft operating along the borders, reached 2,496,894 in 1861. This, on paper, was its culminating figure. The conditions already referred to, the operations of the Southern cruisers, and the interest of capital in other undertakings caused it to drop steadily until 1898, when it was only 726,213—of which less than 500,000 tons were effectively employed away from the coast, the remainder consisting of barges, small craft, superannuated vessels (mostly laid up), vessels sold or lost but not yet erased from the list, and others registered for foreign trade but chiefly engaged in coasting commerce. Since 1898 there has been a material gain, the tonnage on Jan. 1, 1915, being about 1,300,000, of which 300,000 to 400,000 tons were not effectively engaged. Of the total, at least 250,000 tons represented ships transferred to the American flag since the beginning of the great war.

The prospect for the increase of registered shipping (i.e., shipping in the foreign trade—coasting vessels are *enrolled*) and the maintenance of it in normal times is not bright. Even if subsidies are resorted to, they will affect only mail and passenger steamers. The great mass of freight will still be carried by foreign freighters until American vessels of the same class can be built more cheaply and operated more cheaply. The difference in cost of building is much less than it was a few years ago, and by adapting construction processes to American labor conditions (as has been done in locomotive building) the excess may disappear or even appear on the other side of the ledger. But the difference in operating cost is not only the most serious, but for much of it there is no cure in sight—at least for steam vessels. It is

due to higher wages, more officers, larger crews, and many restrictions (without compensation) laid upon operating by unfavorable legislation. A very serious factor is the insurance, which is chiefly effected through European societies, whose interests are bound up with rival shipowners and merchants. This alone, in some trades, would be sufficient to render business unprofitable, even were other things equal. Under present conditions the operation of a 5000-ton freight steamer costs about $15,000 a year more under the American flag than under the British, German, or Norwegian. This is about 5 per cent of the cost of the ship and easily measures the difference between prosperity and unprofitableness. The Seaman's Act, approved by the President on Feb. 28, 1915, will add, when in full effect, still further to the expenses and difficulties of operating American ships by requirements concerning the payment of the crew, their ability to speak English, their qualifications as to experience at sea, etc. Another clause removes all penalties for desertion except forfeiture of part of the wages. In view of this Act, the Pacific Mail Steamship Company has announced the discontinuance of its foreign service, and other shipowners in the foreign trade are preparing to transfer their vessels to other flags. Some of the provisions of this and similar acts are desirable and are in line with modern ideas as to health, comfort, and safety; but as few of them are required in foreign services, and as there are no compensatory features to reimburse the shipowner, they make foreign trade under the American flag more difficult than heretofore.

One of the means of gauging the adequacy of the registered shipping is to determine the proportion of foreign commerce carried in native bottoms. In 1826, 92.5 per cent of the imports and exports of the United States was carried in American ships; in 1913, 10.2 per cent; and it has been (1910) as low as 8.75. This of course takes no account of traffic between ports of foreign nations, if such trade exists, as it did prior to 1860 and especially in the early years of the nineteenth century, when a large part of the deep-sea tonnage was so engaged.

In the summer of 1914, soon after the outbreak of war, the lack of sufficient shipping in the transatlantic trade was severely felt and caused a sharp rise in freight rates. As one means of relieving the difficulty a bill was passed in August, 1914, modifying section 5 of the Panama Canal Act and permitting the registry of stanch and seaworthy foreign-built vessels of any age, providing they were wholly owned by American citizens or corporations. The vessels registered under this Act before Jan. 1, 1915, had a total tonnage of nearly 300,000 and formed a notable addition to the foreign trade fleet; but whether the gain would be permanent would depend upon future conditions.

A minor but still important factor in the development of freight traffic in American bottoms is the new banking law of the United States which permits branch banks abroad. The lack of suitable banking facilities in foreign ports has always militated against American interests, shipping or other.

While the foreign shipping trade has, in the course of years, deteriorated until it is almost negligible, the completely protected coasting fleet has grown to enormous proportions, and the opening of the Panama Canal is likely still further to stimulate it. In 1789, while the coasting trade was unprotected, it had a hard struggle with British vessels for existence. In that year, as already mentioned, a tax of 6 cents per ton was placed on American ships and 50 cents per ton on those of foreign nations. Moreover, the foreigner paid the tax each time he entered port; the American paid once a year. This was practical exclusion. Thus relieved from foreign competition, the coasting trade increased rapidly from 68,607 tons in 1789 to 103,775 in 1790; 164,796 in 1795; 245,295 in 1800; 301,366 in 1805; 371,114 in 1810; and 435,067 in 1815. The Navigation Act of 1817 prohibited foreign vessels from engaging in the coastwise trade, and this prohibition has never been removed.

The advent of steam changed conditions in the coastwise trade much faster than in the foreign, for the very obvious reason that the early forms of marine engines and propelling apparatus were unfit for application to seagoing ships. But steamboats in rivers and protected waters increased rapidly; by 1823 there were 300 of them on American rivers, bays, sounds, and lakes. About this time seagoing coasting steamers, fit to stand moderate weather at sea, were beginning to run on regular service.

Until quite recently the heavy coastwise traffic was largely carried in sailing vessels, and for this purpose the schooner was found most suitable. As the traffic increased in volume the schooners increased in size and number of masts, culminating in the seven masters of to-day, though schooners of three and four masts are and have been the most common. The advantages of the schooner are the ability to lie close to the wind and work through narrow channels, the ease of working the sails so that few men are necessary to handle them, and the reduced cost of rigging, sails, and equipment. Of late years sailing vessels of all kinds are falling into disuse. The larger craft are being displaced by steel or heavy wooden barges, which are towed in strings of two or more by powerful ocean-going tugs. Even small sailing craft and fishing boats are now generally fitted with auxiliary motor engines. The combination of sail and auxiliary, internal-combustion, heavy-oil engines of the Diesel type may be a stage in the development of ocean transportation, for it seems apparent that in slow freight vessels this is the cheapest form of propulsion and ocean freight carriage, and the speed ought to approximate that of the steam tramp.

The Civil War did not seriously interfere with the development of the coasting trade except in the South. After the war the trade was somewhat affected by the diversion of capital and freight to the railways, and the total tonnage decreased slowly until 1878, when it had fallen to 2,444,801 tons. From that time to the present the increase has been continuous and rapid, reaching 6,818,363 tons on June 30, 1914, the last date for which figures are yet available. Of this total 2,882,922 tons were in the Great Lakes and 141,436 tons on Western rivers.

The first vessel built above Niagara Falls was the *Griffin*, a little craft of 45 tons, launched by La Salle in 1679; but it was another hundred years before anything more than the canoes and boats of trappers and explorers were to be found there. As the fur trade grew in importance small brigs were built to carry furs and supplies. The first American vessel on the upper

lakes was the *Washington*, said to have been launched at Erie, Pa., in 1797. After the War of 1812 the development of the Northwest brought about a corresponding increase of shipping on these fresh-water seas. At first this was largely for the transportation of passengers and supplies. The first steamer, *Walk-in-the-Water*, was completed in 1819. By 1830, regular steamer lines ran between Buffalo and Chicago and had gone as far as Detroit a few years before.

In 1833 the Welland Canal was completed, with locks 110 feet long, 22 feet wide, and 8½ feet deep. As small canals have always done, this tended to make all vessels using it take on the general shape of canal boats, to the detriment of their safety, speed, and other qualities. The shallows near Detroit caused the larger lake boats to be broad of beam and light of draft until the government improved the channel.

In 1842–43 the first grain elevator was built at Buffalo, and soon the grain traffic caused a large increase in freight tonnage. The competition of the railways checked this somewhat in later years, but their principal effect was in the lake passenger business, which was nearly destroyed and has only recently revived.

FISHERIES OF THE UNITED STATES

SECTIONS	Vessels employed		Persons employed *	Capital invested *	Value of products
	No.	Tons			
New England (1908)	1,623	44,219	22,157	$11,970,000	$15,139,630
Middle Atlantic States (1908)	3,165	45,208	54,163	11,105,000	16,302,000
South Atlantic States (1908)	534	5,029	17,961	2,324,000	4,034,000
Gulf States (1908)	915	13,665	15,387	3,901,000	4,824,000
Great Lakes (1908)	319	4,499	8,533	4,814,000	3,767,000
Mississippi River and tributaries	39	273	11,825	1,440,000	3,125,000
Pacific coast States (1908)	294	15,618	13,855	6,468,000	6,839,000
Alaska Territory (1913)	444	93,800	21,721	37,047,305	15,739,068
Total	7,333	222,311	165,602	$79,069,305	$69,769,698

* Exclusive of packing houses and canneries.

In 1855 the first canal for large craft was built by the State of Michigan around the St. Mary's River rapids (Sault Ste. Marie) with a depth of 11.5 feet. In the succeeding year 106,296 tons of freight passed through it. The growth of traffic soon demanded new locks, which were finished in 1881; during the next year 2117 steamers of 2,092,757 tons used them. Minnesota iron ore now began to be of importance and added greatly to the tonnage. In 1895 a Canadian canal around the rapids was opened for traffic, and in 1896 the Poe lock on the American side was finished, and in 1914 the Davis lock, also on the American side, with virtually a separate canal, was opened to commerce. The depth through the canals, locks, and river channels is approximately 20 feet, but

TABLE OF TONNAGE OF THE MERCHANT SHIPPING

AND VALUE OF THE FOREIGN SEA-BORNE COMMERCE OF THE UNITED STATES, 1789–1915

YEAR	Tonnage in foreign trade	Foreign sea-borne commerce, exports and imports	Per cent carried in American ships	Tonnage in coasting trade*	Tonnage in whale fishery	Tonnage in deep-sea fishery	Tonnage on Great Lakes
1789 †	123,893	.....	23.6	68,607	.....	9,062	.....
1790 †	346,254	§ $45,000,000	40.5	103,775	.....	28,348	.....
1795 †	529,471	117,746,140	90.0	164,796	.....	24,887	.....
1800 †	667,107	162,224,548	89.0	245,295	3,466	22,307	.....
1805 †	744,224	216,166,021	91.0	301,366	6,015	48,479	.....
1810 †	981,019	152,157,970	91.5	371,114	3,589	26,251	.....
1815 †	‡ 854,295	165,599,027	74.0	435,067	1,230	26,510	.....
1820	583,657	144,141,669	89.5	539,080	36,445	60,843	.....
1825	665,409	180,927,643	92.3	587,273	35,379	70,626	.....
1830	537,563	134,391,691	89.8	496,640	39,705	94,014	.....
1835	788,173	251,980,097	84.5	769,795	97,649	136,817	.....
1840	762,438	221,927,638	82.9	1,144,664	136,927	96,196	.....
1845	904,476	219,224,433	81.7	1,190,898	190,903	91,240	.....
1850	1,439,694	317,885,252	72.5	1,755,797	146,017	143,758	.....
1855	2,348,358	476,718,211	75.6	2,491,108	186,848	124,553	.....
1860	2,379,396	687,192,176	66.5	2,599,319	166,841	153,619	.....
1865	1,518,350	404,774,883	27.7	3,353,657	84,233	100,436	.....
1870	1,448,846	828,730,176	35.6	2,595,328	67,954	82,612	.....
1875	1,515,598	1,046,448,147	26.2	3,169,687	38,229	68,703	.....
1880	1,314,402	1,503,593,404	17.6	2,584,418	38,408	64,935	605,102
1885	1,262,814	1,319,717,084	17.0	2,822,598	25,184	73,975	749,948
1890	928,062	1,647,139,093	12.8	3,330,377	18,633	61,507	1,063,063
1895	822,347	1,456,403,388	11.7	3,644,276	15,839	60,838	1,241,459
1900	816,795	2,089,528,616	9.3	4,195,875	9,899	43,694	1,565,587
1905	943,750	2,393,809,408	12.1	5,441,688	10,763	60,342	2,062,147
1910	782,517	2,982,799,622	8.7	6,668,966	9,308	47,291	2,895,102
1913	1,019,165	3,773,060,925	10.1	6,817,013	8,611	41,762	2,939,786

* Includes tonnage on Great Lakes and of inshore fisheries.
† Figures for these years doubtful; are probably not very far wrong.
‡ Correct figures never determined; these are at least 30 per cent too large. Explanation in text.
§ Estimated.

is gradually being increased by dredging and other work, the new American lock having 24½ feet of water upon its mitre sill with a depth of 25 feet in the canal approaching it both above and below. In 1914, 23,795 vessels of 57,989,715 net tons' register passed through the American and Canadian canals. Owing to the Great European War the iron-ore trade fell off 16,695,888 tons in 1914, and the total trade through the canals was 31 per cent less in 1914 than in 1913. The net tonnage of vessels passing through the American and Canadian canals for 1913 was 57,989,715, and for the Suez Canal in the same year, 19,758,040.

Since 1900 the increase of tonnage of vessels plying on the Great Lakes has nearly doubled. The size of the vessels has steadily grown, many of them being over 7000 tons, and one is over 8000. A large amount of tonnage is in steel barges, several of which are hauled in a single tow by a large cargo carrier or tug. Much of the success of the Lake freight trade has been due to the high efficiency of the design and construction of the vessels and to the novel, cheap, and rapid methods of loading and discharging cargo, which effect the handling of heavy bulk freight such as grain, coal, and iron ore at hitherto unprecedented costs.

One of the important branches of the merchant marine was the whaling industry. Whaling in small boats was practiced by the Colonies as early as 1640, but it was not until near the close of the seventeenth century that whale ships were sent out. In 1775, 150 Nantucket whalers were at sea, but they were mostly of very small tonnage. Most of the records previous to 1800 are incomplete and not very reliable. In that year the reported tonnage was 3466, and the greatest in any year before the outbreak of war was in 1803, when it reached 12,390. In 1817 it was 5224; in 1818, 16,750; and in 1819, 32,386. From that time until 1858 it increased with more or less regularity. The British have always had a good many whaling ships, many of which were in the South Pacific in 1812. Most of the American whalers in that vicinity had been captured by the British letters of marque when Porter appeared in the *Essex*. Before his glorious defeat at Valparaiso, Porter had captured every letter of marque and British whale ship west of Cape Horn and had liberated most of their American prizes, and his success gave such a setback to the British whaling industry in the Pacific that it was long before it recovered. The whaling trade continued to furnish a large part of the deep-sea fleet until quite recent years, its eventual decadence being almost wholly due to the decrease in numbers of the whale. At the height of its success, from 1836 to 1861, whaling was almost exclusively an American industry. In 1842, out of the world's total of 882 whale ships, 652 were American. In 1858 the tonnage engaged was 198,594 and the number of men employed about 25,000.

The deep-sea fisheries have always been an important American occupation, although they have now dwindled to less than one-fourth their former size, measured in tonnage. In 1614 John Smith set up a fishing station at Pemaquid, Me., where his men caught and cured 1200 quintals of fish that sold in Spain for $5 a quintal. During all the early days of the New England Colonies their fisheries were most important to them, affording the products best susceptible of being turned into ready cash. They were therefore carefully fostered and their rights jealously guarded. To the deep-sea fisheries the country was indebted for a very large proportion of the sailors of the Revolution and even of the War of 1812.

These fisheries were almost destroyed by the Revolution. After its close the Treaty of 1783 gave to American fishermen the same rights of fishing and curing fish along the Canadian coast as when British subjects. But the industry was paralyzed. A bounty was offered and the fisheries revived. The War of 1812 again ruined them, but additional bounties were given in 1819 and, notwithstanding opposition and unfair treatment by both England and Canada, it increased more or less steadily until 1862 (tonnage in that year, 193,459), although the bounty laws were repealed in 1858. From 1862 to the present the tonnage engaged has slowly decreased, until in 1913 it was only 41,762, employing 1623 vessels and 22,157 men. The value of the catch was $15,100,000.

The other fisheries have had less to do with the merchant marine proper. The latest statistics in regard to all fisheries are given in the tables on page 428.

Bibliography. The best general survey of the early period is in A. T. Mahan, *Sea Power in its Relations to the War of 1812* (2 vols., Boston, 1905), and the most useful repository of facts for the entire period is Hans Keiler, *American Shipping: Its History and Economic Conditions* (Jena, 1913), which contains a bibliography. Consult also: David MacPherson, *Annals of Commerce* (4 vols., London, 1905); *Report of the Merchant Marine Commission* (Washington, 1905); G. W. Allen, *Our Navy and the Barbary Corsairs* (Boston, 1905); Royal Meeker, *History of Shipping Subsidies* (New York, 1905); Edward Channing, *The Jeffersonian System* (ib., 1906); G. L. Beer, *British Colonial Policy, 1754–1765* (ib., 1907); G. W. Allen, *Our Naval War with France* (Boston, 1909); A. H. Clark, *The Clipper Ship Era* (New York, 1910); W. L. Marvin, *The American Merchant Marine* (ib., 1910); W. D. Reninger, *Government Policy in Aid of American Shipbuilding* (Philadelphia, 1911); B. O. Hough, *Ocean Traffic and Trade* (Chicago, 1914); *Statistical Abstract of the United States Department of Commerce* (Washington, annually). See COMMERCE; NAVIGATION LAWS; SHIP; SHIPPING; SHIPPING SUBSIDIES; UNITED STATES.

MERCHANT OF VENICE, THE. A comedy by Shakespeare, produced probably in 1597, printed in 1600. The earliest version was probably that by Henslowe, in 1594, under the title *The Venesyon Comedy*. The incidents of the play are drawn from many sources. The story of the pound of flesh is very ancient; Shakespeare took the story of Bassanio no doubt from the counterpart, in the *Adventures of Gianetto* in Fiorentino's *Il Pecorone*, written in 1378, but printed in 1558; and possibly from a similar tale in the *Gesta Romanorum*, which contained as well the story of the choice of three caskets, a popular mediæval tale. He may have been indebted to the lost play, *The Jew*, mentioned by S. Gosson in his *School of Abuse*, 1579; but certainly was influenced by Marlowe's *Jew of Malta*. The character of Shylock was drawn in part at least from *The Orator*, by Silvayn; while the story of Antonio and Shylock was foreshadowed in *Three Ladies of London*, by Robert Wilson, 1584.

MERCHANTS, Custom of. See Law Merchant.

MERCHANTS ADVENTURERS. An English company organized in late mediæval times for carrying on foreign trade. Its constitution was that of a regulated company (q.v.), any one having a right to join in the trade upon payment of a fine and agreement to submit to the regulations of the company. The date of its incorporation is not known, but privileges were granted to it by the Count of Flanders as early as the fourteenth century. The principal business of the company was the export of cloth; and it exacted regular contributions from all persons who exported cloth to countries covered by its privileges. In the sixteenth century the chief work in extending English foreign trade was performed by this company. When the Portuguese made Antwerp the depot for Oriental wares the Merchants Adventurers grew rapidly in wealth, since their goods could find a ready sale for the Eastern trade. In the same century the company began a long war with the traders of the Hanseatic League (q.v.), who were infringing upon their monopoly of the export of woolen goods. The Hanseatic traders were at first protected by the crown, but finally were driven from England by a decree of Queen Elizabeth. With the siege and capture of Antwerp by the Spaniards (1584–85) the Merchants Adventurers had to find new centres for carrying on their foreign trade, and finally settled in Hamburg, becoming known as the Hamburg Company. Much of the historical importance of the Merchants Adventurers lies in the fact that their organization served as a model for the great foreign trading companies of the sixteenth and seventeenth centuries. See Regulated Companies.

Consult, for a brief account, "Adventurers, Merchants," in R. H. I. Palgrave, *Dictionary of Political Economy*, vol. i (New York, 1910). A more extended discussion will be found in Lingelbach, *The Merchant Adventurers of England* (Philadelphia, 1902).

MERCHANTS' COURTS. Certain courts which arose out of the guild merchant, by the practice of the guild brethren assuming to do justice at their "morning speeches," or periodical meetings of the society. They first assumed to decide cases of inheritance and succession to membership in the guild, such membership being —as to-day a seat on a stock exchange—regarded as an object of ownership. Later they assumed jurisdiction over actions of debt, covenant, trespass, and such other matters as they could enforce by their decrees. These judicial functions of the guild merchant became well established, in some cases at least, as early as the twelfth or thirteenth century; and the merchants' courts exercised a large influence upon the economic and corporate growth of the municipalities where they existed both in England and on the Continent. These old courts disappeared with the disappearance of the guild merchant, which was superseded by the aggregate of the crafts, and their jurisdiction was taken over by the ordinary courts or by special merchants' courts in London and other trade centres, but the business customs that they recognized and helped to establish became the source of a large part of the mercantile law of to-day. See Law Merchant, and consult the authorities there referred to.

MERCHANT'S TALE, The. One of Chaucer's Canterbury tales. The story is the betrayal of an old husband by a young wife. Tyrwhitt thinks it was taken from a Latin fable by Adolphe of 1315, but the story with the incident of the pear tree is found in many sources. It forms the seventh of the "Fables of Alfonce," added by Caxton to his edition of Æsop, 1484, and is found in "Behar Damish," composed in 1650, though the story, evidently of Oriental origin, is far older. Boccaccio and Chaucer may have drawn it from the "Commedia Lydiæ." An account of these sources is found in the Chaucer Society publications under "Origins and Analogues" of the tales. Pope used the tale as a basis for his "January and May."

MERCIA, mēr′shȧ. An Anglo-Saxon kingdom which at first occupied the upper basin of the river Trent and later conquered most of the territory between the Humber and the Thames. It owed its origin to the fusion of many smaller states. The name Mercians signifies "men of the march," for they were settled along the moorlands, which for centuries remained the borderland between Angle and Welshman. The Kingdom was of little importance until the accession of Penda, c.626, who rapidly attained a supremacy over the other kingdoms after his victory over the powerful Edwin (q.v.), the Deiran King, at Hatfield (or Heathfield) in 633. Penda, however, was defeated c.655 and slain by the King of Northumberland at Winwaed, and for a time Mercian supremacy came to an end. It recovered gradually under Wulfhere (658–675), who was the first Christian King of Mercia, and attained its highest development in the eighth century, especially under Æthelbald (716–757) and Offa (757–796). After the death of the latter the Kingdom declined, and in 918 it was annexed to Wessex. Consult Green, *The Making of England* (New York, 1882). See Heptarchy.

MERCIÉ, mâr′syȧ′, Antonin (1845–1916). A French sculptor and painter, born at Toulouse. He was a pupil of Jouffroy and Falguière and won the Prix de Rome in 1868. His "David Vainqueur" (1872) secured him admission to the Legion of Honor, and the fine patriotic group "Gloria Victis" (1874), now in the court of the Hôtel de Ville, Paris, established his reputation. Other celebrated works are the high-relief "The Genius of the Arts," for the so-called Guichet du Louvre; the group "Quand Même" (1882), at Belfort (replica in the Tuileries Gardens); the statues of Meissonier (Louvre Gardens) and William Tell (Lausanne); the tombs of Cabanel and Michelet in Père-Lachaise and of Louis Philippe in Dreux Cathedral; the figure "Remembrance" in the Luxembourg; the monument to Gounod for the Parc Monceau; Lee in Washington and Francis Scott Key in Baltimore. His best work combines technical skill, feeling, and a certain grandeur of conception, with rhythm, movement, and delicacy of sentiment. His busts are excellent, and he also achieved success as a painter in such canvases as "Venus" and "Sleeping Nymph" (Luxembourg). He was elected a member of the Institute in 1891.

MERCIER, mâr′syȧ′, Desiré Joseph, Cardinal (1851–). A Belgian prelate of the Roman Catholic church. He was born at Braine-l'Alleud, Belgium; was educated at Malines and at Paris and Leipzig; became a priest in 1874; then taught philosophy at the lesser seminary in Malines from 1877 to 1882, when he was appointed to the chair in Aquinas' philosophy founded at Rome by Leo XIII. In 1906 he was

consecrated Archbishop of Malines and primate of Belgium, and in April, 1907, he was made Cardinal. He founded in 1894 and edited until 1906 the *Revue Néoscolastique*, and wrote in a scholastic manner on metaphysics, philosophy, and psychology, several of his works being translated into English, German, Italian, Polish, Spanish, etc. His most important book was *Les origines de la psychologie contemporaine* (1897). His position as Catholic primate of the country brought him into particular notice when Belgium was invaded in 1914 by the Germans. He was forbidden to leave the episcopal residence, and his Christmas pastoral letter, summing up Belgium's losses, preaching patriotism, praising England and blaming Germany, and advising his flock that they need not recognize German authority, was suppressed and the printer fined. For this letter consult the New York *Times*, Jan. 22, 1915.

MERCIER, Honoré (1840–94). A Canadian political leader. He was born at Ste. Athanase, Quebec; was educated at the Jesuit College, Montreal; studied law, and in 1865 was admitted to the Quebec bar. In 1862–64, as editor of *Le Courrier de Saint-Hyacinthe*, he for some time advocated Liberal principles, but he had no sympathy with the cause of Confederation, which in his opinion threatened the political security of French Canadians. He was in 1871 one of the founders of the Quebec Nationalists, organized for the aggressive assertion of French-Canadian racial and religious rights. He became Liberal member for Rouville in the House of Commons (1872–74); but in 1879 he entered Quebec politics, having been appointed Solicitor-General in the provincial administration. Though a Liberal, he later based his policy mainly upon an alliance with the Catholic hierarchy, and was ready to strengthen his party following by accessions from the Conservative and Nationalist ranks. The result was seen after he was elected in 1883 as Liberal leader in Quebec. In 1885 the execution of Louis Riel (q.v.), who had fomented a second rebellion in the Canadian Northwest, greatly excited the French Canadians, who looked upon Riel as a martyr; and Mercier gathered under his leadership all the disaffected sympathizers with the cause of the rebel leader. In 1886 he was successful in the provincial elections and in 1887 became Premier. For four years his administration was the storm centre of both Quebec and Dominion politics. In 1887 he passed a law incorporating the Jesuits, and in 1888 he enacted a measure compensating them for the confiscation of their estates. An agitation for the federal disallowance of this measure became widespread, but the vote in the House of Commons sustained Mercier as acting within provincial rights. In 1890 he was successful in the elections, in 1891 visited Europe, and the honor of Count of the Roman Empire was conferred upon him by Pope Leo XIII. After his return the same year charges of corruption in connection with the Baie de Chaleur Railway scandal were brought against him, and he was dismissed by the Lieutenant Governor. Brought to trial by the succeeding administration, he was found not guilty; but his political importance was lost and his health failed.

MERCIER, Louis Charles Antoine (1744–1812). A French engineer, born at Melun. He entered the French naval service about 1760, but at the outbreak of the American Revolution got permission to join the Patriot forces as a volunteer, and served under d'Estaing and Lafayette. At the close of the war he reëntered the French service, but during the Reign of Terror fled to Louisiana, where in 1803 Napoleon employed him to draw up plans for the protection of the Gulf coast. Later Mercier explored the country as far as Oregon and California. In 1808 he returned to France, where he published *Mémoire sur les vapeurs de l'atmosphère le long du cours du Mississippi* (1808); *Carte du bassin du Mississippi* (1808); *Système hydrographique de la Louisiane* (1809); *Carte du delta du Mississippi* (1810); *Etudes topographiques, géographiques, hydrographiques, géologiques et géodésiques sur la Louisiane* (1811); *Tableau du climat de la Louisiane, et de son influence sur les Européens et les Créoles* (1812).

MERCIER, Louis Sébastien (1740–1814). A French author, born in Paris. At first he wrote novels, some of which, especially *L'Homme sauvage* (1767), were widely read. After having written some dramas, which were severely criticized, he published an *Essai sur l'art dramatique* (1773), in which he contended that the dramas of Racine and Corneille had ceased to be of any interest to the French theatre. Mercier wished to see Diderot's theories realized on the boards; he wished to see life portrayed more faithfully. It was after a prolonged struggle that Mercier had the satisfaction of seeing his dramas, *L'Habitant de la Guadeloupe, La brouette du vinaigrier,* and *Le déserteur,* played on the Parisian stage, where they were enthusiastically received. In his essay *L'An 2440, rêve s'il fut jamais,* published in 1770, he sketches out a programme of political and social reforms. His *Tableau de Paris* (1781), in which the vices and lawlessness of the Parisian aristocracy are described, gave so much offense that he was compelled to leave France. His other books include: *Le nouveau Paris* (1800) and *Histoire de France depuis Clovis jusqu'au règne de Louis XVI* (1802). Mercier was a member of the Convention, in which he voted for the death of Louis XVI, and of the Council of Five Hundred.

MERCIER DE LA RIVIÈRE, mâr'syâ' de lâ rē'vyâr', Paul Pierre (1720–1794). A French economist. In 1758 he became Intendant of Martinique, where he incurred the hostility of the French trading and shipping interests through a liberal administration of the colonial commercial regulations. He returned to France in 1764 and published *L'Ordre naturel et essentiel des sociétés politiques,* pronounced by Adam Smith to be the best exposition of the doctrines of the Physiocrats. Economists of the present day see in this work little more than a loose, popular exposition of the doctrines of Quesnay and Mirabeau. At the time of its publication, however, it created a sensation and procured for its author an invitation to the court of Catharine II of Russia. Mercier's audience with Catharine proved a dismal failure; his pedantry and the abstract character of his political doctrines were utterly repellant to the Russian monarch. Upon his return to France Mercier collaborated with Quesnay, Du Pont, and other members of the school in an active propaganda for economic liberalism. He published numerous articles in the *Ephemerides du Citoyen,* and several books, none of which attracted popular attention or merited scientific consideration.

MERCK, mĕrk, Johann Heinrich (1741–91). A German author and critic, born at Darmstadt and educated at Giessen. From 1768 he

lived in his native town as an army paymaster. His influence on German literature was the result of his critical ability, but chiefly through his early encouragement and intelligent criticism of Goethe, his intimate friendship with Herder, Wieland, Forster, and Lichtenberg, and the prominent part he took in Wieland's *Merkur*, the *Frankfurter gelehrte Anzeigen*, and Nicolai's *Allgemeine deutsche Bibliothek*. In business ventures and in his domestic relations he was unfortunate, his mind became affected, and in 1791 he committed suicide. His correspondence, printed at Darmstadt (1835–38) and at Leipzig (1848), and a selection from his critiques, edited by Stahr (1840), alone remain as evidences of his literary ability. Selections from his works and letters were published in two volumes (Leipzig, 1909). Consult Zimmermann, *Johann Heinrich Merck* (Frankfort, 1871), and Leo Grünstein, *Silhouetten aus der Goethezeit* (Vienna, 1909).

MERCŒUR, mĕr'kĕr', PHILIPPE EMMANUEL DE LORRAINE, DUKE DE (1558–1602). A soldier and Roman Catholic leader in the French "wars of religion." He was the head of the younger branch of the house of Lorraine and cousin to the Guises. King Henry III and Mercœur married sisters, and the King made him Governor of Brittany (1582). The appointment was imprudent, for Mercœur's wife was descended from the ancient dukes of Brittany and Brittany was but newly attached to the French crown. After the murder of the Duke of Guise (1588) Mercœur passed into revolt, declared for the League, and soon proclaimed himself Governor of Brittany. The location and local patriotism of Brittany made it an important factor in the clash of international ambitions. The province was coveted by Philip II as a most valuable stopping place on the voyage from Spain to the Netherlands. For this and other reasons Henry IV was anxious to regain it, and Elizabeth of England was desirous of helping him. Hence, in the decade 1588–98, Spanish troops coöperated suspiciously and half-heartedly with Mercœur, while English troops aided Henry IV's commanders against the Duke and the Spaniards. Mercœur enjoyed the general support of the Bretons and clung to his place until Henry IV marched against him in person in 1598. Then, with the support of Gabrielle d'Estrées, Henry IV's mistress, he made most profitable terms, securing, according to Sully, an indemnity of 4,000,000 livres. His only daughter and heir was betrothed, and ultimately married, to the Duke of Vendôme, a son of Henry IV and Gabrielle, and to him was transferred the government of Brittany. Mercœur subsequently fought the Turks in Hungary, and died, on the way back, at Nuremberg. Consult: L. Grégoire, *La Ligue en Bretagne* (Nantes, 1856); Gaston de Carné, *Documents sur la Ligue en Bretagne: correspondance du duc de Mercœur* (2 vols., Rennes, 1900); Ernest Lavisse, *Histoire de France*, vol. vi, part i (Paris, 1904).

MER'CUR, JAMES (1842–96). An American military engineer and writer. He was born at Towanda, Pa., and, after graduation at West Point, was promoted second lieutenant in the engineers' corps (1866) and first lieutenant (1867). He later became assistant engineer on the survey of the northern and northwestern lakes. In 1867–70 he was assistant professor of natural and experimental philosophy at West Point, and later was principal assistant in the same department (1870–72). He engaged in different river and harbor improvements, notably at Hell Gate (1876–81). He was promoted captain in 1875, was recorder of the board of engineers in connection with the works of Charleston harbor (1878–81), and supervised government engineering and survey work in North and South Carolina, Virginia, and New York (1881–84). In the latter year he was appointed professor of civil and military engineering at West Point, which position he held until his death. He revised and enlarged the treatise by Prof. Dennis Hart Mahan (q.v.) on *Permanent Fortification* (1887) and wrote *Elements of the Art of War* (1888); *Military Mines, Blasting, and Demolitions* (1892); *Attack of Fortified Places* (1895).

MERCU'RIC CHLORIDE, or CORROSIVE SUBLIMATE, $HgCl_2$. One of the two known compounds of mercury and chlorine, the other, which contains a smaller proportion of chlorine, being described under CALOMEL. Mercuric chloride may be prepared by heating a mixture of mercuric sulphate (free from mercurous salt) and common salt with a small percentage of manganese dioxide, and collecting the sublimate in a suitable receiver. The manganese dioxide remains behind unchanged, its presence being desirable only in order to prevent the formation of calomel along with mercuric chloride. Pure mercuric chloride has a specific gravity of about 5.4; it melts at 288° C. (550° F.) and the liquid boils at 303° C. (577° F.). Corrosive sublimate is moderately and very slowly soluble in water, but is quite soluble in ordinary alcohol, which dissolves about one-third of its weight of the sublimate. With the chlorides of the alkali metals, with ammonium chloride, and with many other salts mercuric chloride forms double salts. With alcohols, ketones, aromatic nitro compounds, and especially with the alkaloids, it forms double compounds. Mercuric chloride is a violent poison, the symptoms of acute poisoning being painful gastrointestinal irritation, vomiting, and diarrhœa. A moderate amount of white of egg forms a good antidote. Besides, milk and flour should be given, and vomiting should be induced by mustard and lukewarm water, or by irritating the fauces. In small quantities mercuric chloride is administered internally, either by the mouth or hypodermatically, as a remedy for syphilis, mercury salts being especially valuable in the primary and secondary stages of the disease. Externally mercuric chloride is extensively used as an antiseptic and as an antiparasitic, the maximum strength of solutions thus employed being about one part of the sublimate to one thousand parts of water. It is one of the most powerful antiseptics known.

MERCURIC CYANIDE. See HYDROCYANIC ACID.

MER'CUROUS CHLORIDE. See CALOMEL.

MER'CURY (Lat. *Mercurius*, Gk. Ἑρμείας, *Hermeias*, hence Ἑρμῆς, *Hermēs*, Doric Ἑρμᾶς, *Hermas*). The Latin name for one of the Olympian divinities of Greece and Rome, known to the Greeks as Hermes.

Greece. According to the common Greek legend Hermes was the son of Zeus and Maia, who bore him in a cave on Mount Cyllene in Arcadia. He was widely worshiped in Greece proper and on the Greek islands, in festivals known as *Hermæa*. Immediately after his birth he went forth and stole the cattle of Apollo (then serving King Admetus, q.v., on earth), dragging them backward to his cave. When accused he

stoutly denied the theft even before Zeus, and when convicted succeeded in pacifying his brother by the gift of the lyre, which he had been led to invent on the day of his birth from discovering outside his natal cave a tortoise shell in which only the dried sinews remained. In the *Odyssey* and later Hermes is the messenger of the gods—their herald (κῆρυξ), of supernatural swiftness, often with wings on his shoes and cap, and carrying a magic rod (the later caduceus, q.v.). With this rod he charms men to sleep and wakes them; he is thus able to conduct whom he will wherever he will, unseen of men. He also appears in the latest stages of epic poetry and throughout classical antiquity as Hermes Psychopompos, who conducts the souls of the dead to the lower world, where he intrusts them to Charon, who ferries them over the Styx. He was also the herdsman's god, being especially worshiped to secure increase of the flocks. And from this function perhaps arises connection with the ram and the calf, both of which are associated with him in cult and art. Travelers looked to him for guidance and help on their journeys, and traders venerated him as one who could increase their gains, for he was the god of good luck and "windfalls." He was also the patron of thieves; perhaps originally of cattle raiders. He was also honored in the palæstra and gymnasium, where his statues were erected, as the guardian and favorer of manly sports. In later times he appears frequently as a god of eloquence and persuasion.

Perhaps his most common appearance in the Greek world, certainly in Attica, was as the god of roads and boundaries. Square pillars, called *hermæ*, were common as guideposts and boundary marks. They usually bore the head of the god and a phallus, and on them, as a sacred place, food was sometimes left for needy wanderers. The pillar seems the essential and original sign of the god, and perhaps even earlier the god was present in cairns or heaps of stones, which were called *hermæa*. The worship of Hermes therefore shows a mixture of elements in which conceptions of a heavenly god are combined with worship of rude stones. The name has not been satisfactorily explained, for its etymological identity with *Sarameyas* or *Sarama*, the *dog* of the gods of Indian mythology, is by no means certain, and any other connection in the conceptions of Hermes and Sarameyas is hard to see. It is possible that ἕρμα, a "mound" or "cairn," is at the basis of the name, and that the pile of stones in the pasture or on the road is the dwelling place of the god who protects the herds and the wayfarer. Many of his functions, however, agree well with the theory of Roscher, that Hermes is a wind god. This explains his position as swift messenger of the gods, and as guide of the souls, for *wind* and *soul* are closely connected in the primitive conceptions. The variety and apparent lack of connection in his functions would find easy explanation in the union of divinities originally separate.

In art the types of Hermes show a marked change in the course of time. At first he is a bearded man, with the petasus, or broad-brimmed hat, winged shoes, and his herald's staff. Later the type becomes distinctly youthful and vigorous, sometimes with short-girded tunic and cloak, but with the figure often nude, or but lightly draped. The most famous extant statue of Hermes is the beautiful figure at Olympia, representing the god holding the infant Dionysus, the work of Praxiteles. See illustration 3 with POLYCLITUS. For Hermes Trismegistus, the Hermes identified with the Egyptian god Thoth, see the paragraph *Egypt*, below. Consult W. H. Roscher, *Hermes der Wind-Gott* (Leipzig, 1878); "Hermes," in W. H. Roscher, *Lexikon der grieschischen und römischen Mythologie*, vol. i (Leipzig, 1884–90); Gruppe, *Griechische Mythologie und Religionsgeschichte*, vol. ii (Munich, 1906); L. R. Farnell, *Cults of the Greek States*, vol. v (Oxford, 1909). See HERM.

Rome. Mercurius was brought to Rome from the Greeks of southern Italy, as the god of merchants and trade, and this always remained his character in the true Roman religion, as his attributes of the purse and caduceus plainly show. To him, in this respect, a temple was erected in Rome as early as 495 B.C. For Mercury as a god of trade (and its trickeries), consult especially Ovid, *Fasti*, v, 663–692. He was the god especially of the *mercatores*, or merchants engaged in transmarine commerce, and of the dealers in grain, but ultimately was patron of all who bought and sold. His main festival was celebrated annually on May 15, in the Circus Maximus, near the Aventine Hill. The literature of course presents him in all his varied Greek activities (consult, e.g., Horace, *Carmina*, i, 10), but these are absent for the most part from the inscriptions. As the Roman traders penetrated to the north they identified with their tutelary god the Celtic Esus, and even found grounds for regarding the Germanic Wotan as the same divinity. Consult W. W. Fowler, *Roman Festivals* (London, 1899), and G. Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1909).

Egypt. Another divinity identified with Hermes was the Egyptian god Dhouti or Thoth—called Thout(h) or Thôt by Greek writers—and in this case the resemblance is more striking. Originally Thoth was the local god of Chmûnu, the Greek Hermopolis (q.v.), and is usually represented in the form of, or with the head of, an ibis. Before historic times, however, he had become a moon god, worshiped throughout Egypt, and he plays an important part in Egyptian mythology as the assistant of the sun god in his fight against hostile powers. (See HORUS.) He was the inventor of writing and the scribe of the gods. A euhemeristic Phœnician tale represents him as a man of ancient times, who invented letters and communicated his discovery to his King, Thamus. Thoth was the judge who decided between Osiris (or Horus) and Set, and he assisted as recorder at the judgment of the dead. (See DEAD, JUDGMENT OF THE.) He was the patron of learning and the inventor of all sciences, including especially astronomy and medicine. His sacred animals were the ibis and the cynocephalus. On Thoth as Hermes Trismegistus and on his writings, see HERMETIC.

Other Countries. According to Greek accounts, Taaut would seem to have been the Phœnician Hermes, the inventor of letters and sciences; but this is only a late importation of Egyptian ideas, as may be seen from the name of the deity and from the fact that he is called a son of Misor, or Egypt. Sumes, a name of obscure etymology, is given as the Punic name of Hermes. Among the Babylonians Nabû, the god of Borsippa, worshiped in the planet Mercury, corresponded to Hermes in many of his attributes. The later Arabs relate many fables

about Hermes, stating, e.g., that Hermes Trismegistus (see the paragraph *Egypt*, above) once lived at Calovaz in Chaldæa, but these stories are all worthless distortions of very late Greek traditions.

MERCURY. The planet nearest the sun. Its mean distance from the sun is 35,700,000 miles, its periodic time 88 days, its diameter 2770 miles, mass $\frac{1}{10}$ of the earth's; density 0.56, that of earth being unity. The eccentricity of its orbit is greater than that of any other major planet, being 0.20562, and consequently its greatest and least distances from the sun differ by nearly 15,000,000 miles; the inclination of the orbit to the ecliptic is 7° 0′ 1.4″ Since Mercury is an inferior planet it is seen alternately east and west of the sun, at an apparent angular distance never exceeding 29°, and its apparent motion in the orbit is at times retrograde. When a change in the apparent motion takes place it appears for a short time stationary. During the year Mercury is morning star in the east three times and evening star in the west three times. Owing to its nearness to the sun it is never above the horizon more than about two hours after sunset or the same time before sunrise. On this account, and from its small apparent size (5″ to 13″ angular diameter), it is seldom distinctly observable by the naked eye. It is said that Copernicus was never able to see it. It is very difficult to observe any markings on Mercury's surface, and there is consequently much doubt as to the period of revolution on its axis. In 1889 Schiaparelli (q.v.) announced that he had been able to fix this period at 88 days, in precise accord with the period of the planet's revolution around the sun. If this be correct (and it has received some confirmation from the observations of Lowell), Mercury always turns the same side towards the sun. This undecided question concerning the rotation time of Mercury is of much importance in theoretical astronomy. Like Venus, Mercury shows phases (q.v.) similar to those of the moon. On account of the great eccentricity of its orbit its longitudinal libration is much greater than that of the moon, amounting to 47°; consequently only three-eighths of the surface of the planet is always illuminated and three-eighths is always dark. See ASTRONOMY; PLANETS; SOLAR SYSTEM; TRANSIT OF VENUS.

MERCURY, or QUICKSILVER. A metallic element that has been known since ancient times. As early as 300 B.C. Theophrastus mentions "liquid silver," which he says is obtained by rubbing cinnabar with vinegar in a copper vessel. Dioscorides describes the production of mercury by subliming cinnabar with charcoal in an iron pot. Pliny gave it the name of *hydrargyrum* when so obtained, while native mercury he called *argentum vivum*. Mercury was extensively studied by the alchemists, who believed that it was one of the component parts of all metals, and they were familiar with the method of purifying it by distillation. Many of the alchemists and iatrochemists considered mercury a metal; but this was disputed, and even as late as 1735 some chemists contended that it was a semimetal. Not until 1759, when Braune found it possible to solidify it by exposure to a freezing mixture, was its metallic nature established beyond dispute.

Mercury is found in small quantities in the metallic state, but the sulphide *cinnabar* with 86.2 per cent mercury is the most common ore mineral. Silver and gold amalgam, *calomel* (HgCl), quicksilver oxide (*montroydite*), are found, and may be secondary minerals developed from the sulphide. Mercurial tetrahedrite is not uncommon, while primary minerals of rare occurrence include black telluride of quicksilver (*coloradoite*), the selenide (*tiemannite*), etc. Mercury ores are found in formations ranging from Ordovician to recent in age, and in many different kinds of rock, although igneous rocks are often more or less closely associated with the ore. The ores occur as veins, disseminations, or as irregular masses, with silica, calcite, and bitumen as commonly associated minerals. Although mercury ores are widely distributed, the main production comes from a few occurrences. In the United States the coast ranges of California contain a number of deposits, whose yield in the past has been considerable, while the more recently developed district of Terlingua, Texas, has contributed notably to the supply. In Europe long-productive deposits are known at Almaden, Spain, while the ore bodies of Tuscany and Vallalta-Sagron, Italy, and Idria, Austria, are also of importance. In 1913 the production of the different countries in metric tons was as follows: United States, 688; Spain, 1490; Austria-Hungary, 855; Italy, 988; Mexico and others, 150; total, 4171. Exports of quicksilver from the United States, which were one and a half million pounds in 1904, fell steadily to 1914 when they were 64,000 pounds.

Mercury (symbol, Hg; atomic weight, 200) is a silver-white liquid metal that solidifies at −39.5° C., and, while slightly volatile at ordinary temperatures, boils at 357° C. Its specific gravity at 0° C. (32° F.) is 13.59. Mercury is used chiefly in the manufacture of fulminate for explosive caps, of drugs, of electrical appliances and scientific apparatus, and to a lesser extent than formerly in the separation of gold and silver from their ores. A new use is the floating of lighthouse lights on a body of quicksilver. It dissolves and possibly combines chemically with nearly all of the metallic elements to form alloys termed "amalgams." (See AMALGAM.) With oxygen it forms two oxides. One of these, the *mercurous* oxide, is obtained by the action of caustic alkalies on mercurous salts. The other, the mercuric oxide, can be obtained either as a brick-red or a yellow substance. Careful heating of mercuric nitrate yields the red modification, while adding a solution of a mercuric salt to a solution of sodium or potassium hydroxide gives the yellow form. The mercuric oxide is used in medicine and as an oxidizing agent in chemical operations. Corresponding to the two oxides mercury forms two series of compounds, which are known as mercurous and mercuric salts. Among these one of the most important is the mercuric sulphide found native as cinnabar, and when prepared artificially is the red pigment known as vermilion (q.v.). The two chlorides are important commercial salts, and of these the mercurous chloride or *calomel* (q.v.) occurs native; the artificial product is used largely in medicine to correct torpidity of the liver. The mercuric chloride, or *corrosive sublimate*, finds extensive use in medicine as an antiseptic, and is extensively used for the preservation of skins and natural-history specimens. Mercuric ammonium chloride is a white powder that is extensively used in medicine, under the name of *white precipitate*, especially in the form of ointment. Metallic mercury and its salts are poisonous, and

chronic mercurial poisoning is common among those who habitually work with the metal. When taken internally, salivation, ulcers of the mucous membrane of the mouth, and ultimately paralysis, result. The usual antidotes are albumen, milk, and flour and water. See also HYDRIODIC ACID; HYDROCYANIC ACID.

Metallurgy. Many mercury ores now worked may not contain more than 1 or 2 per cent of the metal. Practically the only ore which is regularly worked for mercury is cinnabar. Mercury may be extracted from cinnabar in several ways, but two methods only are used upon a large scale. They are (1) extraction by heating the ore in furnaces having a free supply of air, and (2) extraction by heating the ore with lime or iron in retorts, air being excluded. In both methods the chemical reactions take place at temperatures above the boiling point of mercury, so that the latter is volatilized and has to be condensed. Heating the cinnabar with access of air is a process performed in shaft, reverberatory, or shelf furnaces, and is preferred to methods using lime or iron, inasmuch as it is more economical and less dangerous to the workmen. The leading objection to this method is the dilution of the mercurial vapors by sulphur dioxide, oxygen, nitrogen, and the products of combustion. For these reasons it is rather difficult to condense the mercury, and therefore there are losses of the metal through incomplete condensation. On the other hand, where the mercury is extracted by heating the cinnabar with lime or iron in retorts, the mercurial vapors are in a condensed form because no air is allowed to enter the retorts. These vapors are condensed so that with a high grade of ore the output is somewhat greater than by the first process. On account of the greater expense of labor and fuel, and the unhealthfulness of the process, due to the escape of mercurial vapors in emptying the retorts, the process is less frequently employed.

Mercury is transported in wrought-iron flasks closed by a screw stopper, each flask holding about 76 pounds of metal. Sheepskin bags are also used for this purpose.

Bibliography. G. F. Becker, "Quicksilver Deposits of the Pacific Slope," in *United States Geological Survey, Monograph 13* (Washington, 1888); Egleston, *Metallurgy of Silver, Gold, and Mercury* (New York, 1890); C. Schnabel, *Handbook of Metallurgy* (ib., 1905–07); Heinrich Ries, *Economic Geology* (3d ed., ib., 1910); McCaskey, "Quicksilver," in *United States Geological Survey, Mineral Resources* (Washington, 1911); Waldemar Lindgren, *Mineral Deposits* (New York, 1913).

MERCURY, DOG'S (*Mercurialis*). A small genus of plants of the family Euphorbiaceæ. The common dog's mercury (*Mercurialis perennis*), common in woods and shrubby places in Europe, has a simple stem about a foot high, rough ovate leaves, and axillary loose spikes of greenish flowers. It turns a glaucous black in drying. The root, which is very poisonous, contains two coloring substances, one blue and the other carmine. The mercury mentioned by some writers as a potherb is not this plant, but *Chenopodium bonus-henricus.* Annual dog's mercury (*Mercurialis annua*) is eaten in Germany as spinach. The three-seeded mercury is an allied plant, *Acalypha,* of which there are a number of species.

MERCURY, MEDICINAL USES OF. The 21 official preparations of hydrargyrum, or mercury, may be classified as follows: (1) *preparations of mercury,* including mercury with chalk, blue mass, mercurial ointment, and two plasters of mercury; (2) *the chlorides of mercury and their preparations,* including calomel, corrosive sublimate, and others; (3) *the oxides and their preparations,* including the red precipitate and others; (4) *the iodides and their preparations,* including the red iodide, the yellow iodide, and others; (5) *acid combinations and their preparations,* including the solution of mercuric nitrate and others; (6) *cyanide of mercury;* and (7) *the triturations.* Besides the official preparations the following unofficial preparations are well known: yellow solution of mercury (yellow wash), black lotion of mercury (black wash), and red ointment of mercuric nitrate (brown citrine ointment).

Mercury is purgative, alterative, and tonic, and promotes the flow of bile. Some of its preparations are corrosive, some are caustic, some are poisonous. In small quantities some of the mercurials are tonic, while in large or long-continued doses they cause poverty of the blood, diminishing the number of the red corpuscles, reducing nutrition, and impairing digestion, finally causing waste of tissue. Long-continued exhibition of mercury causes a cachectic condition termed hydrargyrism. Mercury stimulates glands to a production of an increased amount of secretion. Hydrargyrism, commonly called salivation from one of its symptoms, is recognized by a fœtid breath, swollen and spongy gums with a blue marginal line, sore mouth, swollen and tender tongue, excessive production of saliva, loss of appetite, diarrhœa, and fever.

Mercury is used in syphilis, tonsillitis, and other glandular affections, gastritis, dysentery, gastric ulcer, early cirrhosis of the liver, typhoid fever, diphtheria, Asiatic cholera, pneumonia, gastroenteric disturbances, conjunctivitis, enlarged thyroid, and enlarged spleen. Mercury, according to the modern view, is not curative of syphilis as is salvarsan (q.v.). In syphilis intensive medication has lately been tried by means of hypodermic injections, gray oil, salicylate of mercury as well as the benzoate and succinimide being used for this purpose.

Bichloride of mercury is very largely used as an antiseptic. It is irritant and corrosive, and in toxic doses causes severe gastrointestinal irritation, nausea, vomiting, suppression of urine, bloody diarrhœa, convulsions, and collapse. It is, however, a safe and valuable internal remedy in proper dosage. It is used locally as a parasiticide in a solution of 1 part in 250 parts of water, and as a general surgical antiseptic in a solution of 1 part to 1000 of water, or 1 to 2000, sometimes 1 part to 5000 of water. In these dilutions it is an efficient antiseptic for cleansing wounds, moistening gauze dressings, injecting into cavities, etc. See ANTIDOTE; TOXICOLOGY.

MERCURY, WAND OF. See DIVINING ROD.

MERCURY FULMINATE. See EXPLOSIVES.

MERCUTIO, mĕr-kū′shĭō. A character in Shakespeare's *Romeo and Juliet,* the kinsman of the Prince of Verona and friend to Romeo. He is killed in a quarrel with Tybalt.

MERCY, FATHERS OF. A religious congregation of the Roman Catholic church founded by Jean-Baptiste Rauzan (1757–1847), a zealous French priest, at Lyons in 1808, later suppressed by Napoleon, and reëstablished in 1814. Its constitution was approved by the Pope in 1834, under the title of Society of the Priests of

Mercy. The members devoted themselves to mission preaching and works of charity. Monsignor De Forbin-Janson, Bishop of Nancy, brought two of them to America in 1839, and houses were established in New York and in St. Augustine, Fla. Shortly after they came to New York to take charge of the French Catholics, and still have charge of certain parishes in Manhattan and Brooklyn. In 1903 the mother house in Paris was closed by the government under the Associations Law, and the headquarters were accordingly transferred to Rome. Consult Delaporté, *Vie de Jean-Baptiste Rauzan* (Paris, 1857).

MERCY, Sisters of, or Order of Our Lady of Mercy. A Roman Catholic religious community founded in Dublin in 1827. They are of two classes, choir sisters and lay sisters, the choir sisters being occupied with the visitation of the sick and prisoners, the care of poor and virtuous girls, and other charities; the lay sisters being employed in the domestic occupations of the convent. Each community is independent of the rest of the order, being subject only to the bishops. The origin of the order was due to Miss Catherine McAuley, of Dublin, who, born of Roman Catholic parents and left an orphan, having been educated a Protestant, joined the Roman Catholic church and devoted her life and ample fortune to the service of the poor. The order has been introduced into many parts of Ireland, England, Scotland, and America. After a preliminary preparation of six months, candidates assume the white veil and become novices. The novitiate lasts two years. Their vows bind them to poverty, celibacy, obedience, and the care of the sick and poor. In the United States their first, now the mother, house was opened in Pittsburgh, Pa., in 1843, and they are now very widespread, numbering over 4700 sisters and having, in addition to schools, 53 hospitals and 67 orphanages. Consult Carroll, *Life of Catherine McAuley* (London, 1866), and *Leaves from the Annals of the Sisters of Mercy* (3 vols., New York, 1881).

MERCY SEAT. The ordinary translation of the Hebrew *Kapporeth* (Ex. xxv. 17 et seq.), signifying the "covering" of the Ark of the Covenant (q.v.).

MER DE GLACE, mâr de glâs (Fr., sea of ice). One of the largest and most interesting of the Alpine glaciers. It lies on the northern slope of Mont Blanc and is formed by the confluence of three branches known as the Glacier du Géant, the Glacier du Lechaud, and the Glacier du Talèfre. Its extreme length is about 9 miles, and in all it covers an area of 16 square miles. The rate of flow, compared with other glaciers of the Alps, is very rapid, the average advance during the summer and autumn months being about 2 feet per day. The Mer de Glace is noted for its beautiful scenery and is one of the favorite tourist resorts in the Alps. It is most easily reached from the village of Chamonix, near which it debouches into the valley as the Glacier des Blois and gives rise to the Arveyron River. See Glacier; Mont Blanc; and Illustration accompanying Chamonix.

MÉRÉ, Paul Louis. See Courier de Méré, P. L.

MER'EDITH, George (1828–1909). A distinguished English novelist and poet of mixed English, Irish, and Welsh descent. He was born in Portsmouth, Hampshire, the son of Augustus Armstrong Meredith, a naval outfitter, on Feb. 12, 1828. In his fourth year his mother died. He became a ward in chancery. He was educated at Portsmouth and Southsea, and at Neuheim on the Rhine; and he remained until he was sixteen in Germany—a land whose influence, especially through its poetry and music, is perceptible in his writings. On returning to England he studied law for a while, but soon abandoned it, as his literary genius began to make itself felt. His first published poem, "Chillian-Wallah," appeared when he was only 21, in *Chambers's Journal* (July, 1849), and he lived somewhat precariously for a number of years by journalistic work. He married, in 1849, Mrs. Nicholls, a daughter of Thomas Love Peacock (q.v.), and it was to Peacock that he dedicated his first volume, *Poems* (1851). From Mrs. Nicholls (died 1861) he separated, and in 1864 married Miss Vulliamy (died 1885). Original and unique as Meredith's novels are, it is possible to trace in them an inheritance from the dilettante, whimsical work of his father-in-law. After *The Shaving of Shagpat,* "an Arabian entertainment" (1855), and *Farina,* an imitation of a grotesque phase of German romanticism (1857), he published his first novel in 1859—strange as it now seems to associate the two dates, the year of the publication of George Eliot's first novel, *Adam Bede.* This book, *The Ordeal of Richard Feverel,* which many of his admirers think he has never surpassed, contains some of his most beautiful passages in its tender love episodes with their note of Celtic passion. *Evan Harrington* (1861) was a more purely humorous treatment of the psychological problems involved in the great question whether a tailor could be a gentleman. A year later appeared *Modern Love, and Poems of the English Roadside.* The splendid sonnet sequence, *Modern Love,* is now recognized as probably its author's highest and most durable achievement in the poetic form; but at the time it was severely criticized, especially by the *Spectator,* in which Swinburne replied with a fervid eulogy. Among the few accessible biographical data, the close association of three of the foremost writers of the century is worth mentioning; for a short time in 1863, after the first two had lost their wives, Meredith, Rossetti, and Swinburne shared a house in Cheyne Walk, Chelsea. *Emilia in England* (afterward called *Sandra Belloni*) came out in 1864, and the next year *Rhoda Fleming,* as a story the simplest and the best told from an artistic point of view—a savage onslaught on the idols of fatuous respectability, a digging down to the elemental and primitive passions. When the war between Austria and Italy broke out in 1866, Meredith, who had already done considerable work in journalism, went out as the correspondent of the *Morning Post.* He turned to good account the knowledge of Italy thus gained and his sympathy with Mazzini and the cause of Italian independence in his next book, *Vittoria,* a sequel to *Emilia in England* (1867). For some 30 years he acted as literary adviser to the publishing house of Chapman and Hall, and helped many a young author by his wise and kindly criticism. Thomas Hardy, in particular, has said that he would probably never have persevered in the path of literature without the encouragement which Meredith gave him when he submitted his first manuscript. Meanwhile Meredith was going on steadily with his own work. In 1871 he brought out *The Adventures of Harry Richmond,* a fascinating romantic

novel, which is recommended to beginners as easier reading than the metaphysical, subtle, enigmatic style of his later books. It had undoubtedly no small influence on younger writers, and the class of romantic stories at the head of which stands *Prince Otto* may be clearly derived from it. *Beauchamp's Career* (1876) is largely occupied with English politics. While standing aloof as usual from questions of actual detail, Meredith allowed his philosophic liberalism to be seen almost distinctly, though he did not declare for either side. *The Egoist* (1879) made a pitiless analysis of innate selfishness. In its central figure, Sir Willoughby Patterne, the complete egoist takes on final shape and becomes typical. In fact, it may be said of Meredith generally that, unlike most psychological novelists, he gives us a psychology of types, not of individuals. In 1880 came *The Tragic Comedians*, recounting in the guise of fiction a decisive episode in the life of Ferdinand Lassalle, the German Social Democrat; and in 1883 another volume of verse, *Poems and Lyrics of the Joy of Earth*. All this time, in spite of such a bulk of admirable work, and although recognized by an increasing number of cultivated people, Meredith had remained strangely unknown to the public at large—in this like Browning, with whom in many ways his genius had strong affinities. The publication of *Diana of the Crossways* (1885), partly, perhaps, because its central episode bore a strong resemblance to an actual occurrence in English political life of a generation earlier, made a general impression and drew attention to work Meredith had done a quarter of a century earlier. From this time he came more and more to be recognized as the head of the profession of letters in England. He was elected president of the British Society of Authors on the death of Tennyson in 1892; and his appearance as the guest of honor at the meeting of the Omar Khayyam Club (an organization including many of the best-known men of letters) in 1895 was an event of singular interest, from the universal homage paid to him, as well as from the fact that he then made what he called his first public speech. On his seventieth and eightieth birthdays he was presented with congratulatory addresses, signed by the most prominent English writers of the day, and in 1905 he received the Order of Merit from Edward VII. He died May 18, 1909. A memorial service for him was held in Westminster Abbey, but he was not buried there, despite a widespread desire and a petition sanctioned by the Prime Minister, Asquith. His body was cremated and the ashes placed beside his second wife's grave at Dorking. Four more novels remain to be mentioned: *One of Our Conquerors* (1891), *Lord Ormont and his Aminta* (1894), *The Amazing Marriage* (1895), and the early but unfinished and posthumously published *Celt and Saxon* (1910), as well as notable volumes of verse—*Ballads and Poems of Tragic Life* (1887), *A Reading of Earth* (1888), *The Empty Purse* (1892), *Odes in Contribution to the Song of French History* (1898), *A Reading of Life* (1901), and *Last Poems* (1910), published after his death. His poems, like his novels, will probably never be popular; and for the same reason, that they require too much thought on the part of the reader. Yet as a poet he has many remarkable achievements to his credit, and none more signal than the expression of a perfect understanding of nature—nature as she is in herself, not, as with Byron and so many others, the mere reflex of the poet's temperament and moods. A comedy, *The Sentimentalists*, which was presented in 1910, may also be mentioned here.

Meredith's fiction is characteristic of an age of analysis and introspection, when every art must take account of the results of psychology and metaphysics. He is before all things a student of life. His attitude, as illuminated by the *Essay on Comedy* (1877), is not unlike that of his own Adrian Harley in *Feverel;* with an amused but not unkindly cynicism he stands off and watches his characters act on each other as deliberately, as inevitably, and often through situations as apparently unimportant as in life. He shows us the progress from act to act of dramas subtly philosophical, in the manner of *Hamlet*. We are reminded of Shakespeare again as we think of one of Meredith's strongest points—his gallery of fair women, types of the best in their age, for parallels to which we are driven to recur to Beatrice and Rosalind and Portia.

His style is frequently obscure—not because he cannot write simply, for (like Browning again) he can give us "English as ripe and sound and unaffected as the heart could wish." His aim, however, is not simplicity; it is to pack as much thought as possible into a phrase, to say only what is worth saying, and to say it in terms charged to the fullest with significance. The final verdict of his contemporaries, slowly though it was reached, is justified by his unquestioned intellectual eminence.

Bibliography. The Memorial Edition (London, 1910) of Meredith's complete works is the best, for the Authorized Edition (London, 1897) contains only the works as revised—with excisions—by the author. The former, while giving the revised text, includes the excisions separately for those who desire them. To many good judges the novels in their earlier and unrevised forms are superior to the later revised versions. Not included in his collected works may be mentioned *Up to Midnight: A Series of Dialogues . . . now Reprinted for the First Time* (Boston, 1913), which may have its interest for Meredithians. Consult: Richard Le Gallienne, *George Meredith: Some Characteristics* (London, 1890), which contains a careful bibliography; essays by W. E. Henley, in *Views and Reviews* (ib., 1890), and by W. C. Brownell, in *Victorian Prose Masters* (New York, 1901); W. L. Cross, *The Development of the English Novel* (new ed., ib., 1905); M. W. Abbott, *Browning and Meredith: Some Points of Similarity* (Boston, 1904); P. E. More, "Novels of George Meredith," in *Shelburne Essays* (2d series, New York, 1905); M. S. Henderson, *George Meredith* (London, 1908), valuable; J. A. Hammerton, *George Meredith in Anecdote and Criticism* (ib., 1909); J. W. Beach, *The Comic Spirit in George Meredith: An Interpretation* (New York, 1911); A. M. Trevelyan, *Poetry and Philosophy of Meredith* (ib., 1912); William Sharp, in *Papers, Critical and Reminiscent* (ib., 1912); *Letters of Meredith* (2 vols., ib., 1912), edited by his son.

MEREDITH, Louisa Anne (née Twamley) (1812–95). An Australian writer, born at Birmingham, England. Chiefly educated by her accomplished mother, at an early age she wrote verse and practiced art with success. In 1833 she published an octavo volume of *Poems with Illustrations*. She continued to write, and in 1839 married her cousin, Charles Meredith, and accompanied him on his return to Australia.

Her *Notes and Sketches of New South Wales* was followed by *My Home in Tasmania* and many other notable works. In 1860 appeared *Some of my Bush Friends in Tasmania*, a large and elaborate work on the flora of the colony. Poems and novels followed. The Tasmanian government granted her a pension of £100 a year. She received numerous prize medals for botanical drawings of Tasmanian subjects, at the exhibitions of London, Melbourne, Sydney, and Calcutta. Her first volume of verse appeared in 1833, and her last, *Grandmama's Verse-Book for Young Australia*, in 1878.

MEREDITH, Owen. The pseudonym of Lord Lytton. See Lytton, Edward Robert Bulwer.

MEREDITH, Solomon (1810–75). An American soldier and politician, born in Guilford Co., N. C. He removed to Indiana in 1830, was sheriff of Wayne County (1834 and 1836) and member of the Legislature (1846–48 and 1854–56), and upon the outbreak of the Civil War he was made colonel of the Sixty-ninth Indiana Volunteers. He participated in many of the most desperate battles fought by the Army of the Potomac and became the commander of the famous Iron Brigade. He fought at Gainesville, Chancellorsville, and Gettysburg. At the close of the war he was retired with the brevet rank of major general of volunteers. He was deeply interested in scientific agriculture and introduced several improvements.

MEREDITH, Sir William Ralph (1840–). A Canadian jurist and politician, born in Middlesex Co., Ontario, of Irish descent. He was educated in London, Ontario, and at Toronto University, studied law, and was called to the bar in 1861. He practiced his profession for many years in London, and in 1888 removed to Toronto. In 1872 he was elected a Conservative member of the Ontario Legislature, and in 1878 became leader of the Conservative Opposition therein, a position which he retained until 1894, when he was appointed Chief Justice of the Court of Common Pleas. In 1895 he was made a senator, and in 1900 chancellor, of Toronto University; this office he held for more than 14 years. In 1912 he became Chief Justice of Ontario. He was knighted in 1896. He manifested remarkable ability both as a lawyer and parliamentarian and was identified with much useful and progressive legislation, especially in behalf of workingmen. He was a member of the commissions for the revision of the provincial statutes (1896 and 1906), for investigating the affairs of Toronto University (1905), and upon laws relating to the liability of employers (1910).

MERES, mērz, Francis (1565–1647). An English author and divine. He was educated at Pembroke College, Cambridge, graduating B.A. in 1587 and M.A. in 1591. By 1597 he was living in London, where he gained an intimate knowledge of contemporary literature. In 1602 he became rector of Wing in Rutland and subsequently opened a school. He died at Wing, Jan. 29, 1647. His *Palladis Tamia, Wits Treasury* (1598) gives an account of Marlowe's death and an estimate of Shakespeare. After mentioning 12 of Shakespeare's plays and the "sugred sonnets among his private friends," Meres says, "The muses would speak Shakespeare's fine filed phrase, if they could speak English." The important sections dealing with Elizabethan literature were reprinted in *Shakspere Allusion Books*, New Shakespere Society (London, 1874), and by Arber in the *English Garner*, vol. ii (London, 1879).

MERETRIX, mĕr′ē-trĭks. See Hetæræ.

MEREZHKOVSKY, mē′rĕsh-kôf′skĭ, Dmitry Sergeyevitch (1865–). A Russian poet, novelist, and critic. He was born and educated at St. Petersburg. He published his first volume of verse in 1888. This was followed by two other collections, after which the author forsook poetry for prose. He made his début as a literary critic with an essay entitled "The Causes of Decadence in Modern Russian Literature" (1893), which attracted considerable attention. When he published his scholarly and comprehensive studies, *Tolstoy and Dostoyevsky as Men and as Artists* (1901) and *The Religion of Tolstoy and Dostoyevsky* (1902), his reputation as a critic was firmly established. Then came his trilogy of historical novels dealing with the great conflict of Christianity and paganism. The series is entitled *Christ and Antichrist* and the separate volumes are variously known as *The Death of the Gods, or Julian the Apostate* (1901); *The Resurrection of the Gods, or Leonardo da Vinci* (1902); and *Peter and Alexis* (1905). Some idea of the nature and magnitude of this work may be had from the fact that its author spent 12 years in its preparation, which involved extensive travel. The entire series, as well as his studies of Tolstoy and Dostoyevsky, may be had in English and other languages. Mention should be made also of his dramas *Paul I* (1908) and *Alexander I* (2 vols., 1913). His other work includes much critical writing and translations of classic drama. His collected works, published at St. Petersburg in 1911–12, number 15 volumes. Consult Persky, *Contemporary Russian Novelists* (Boston, 1913).

MERGAN′SER (Neo-Lat., from Lat. *mergus*, diver + *anser*, goose). A small subfamily of ducks, Merginæ, having a slender, straight, much compressed bill, hooked at the tip and notched at the edges, almost as if furnished with teeth. Their other anatomical peculiarities are like those of the sea ducks. They feed largely upon fish, which they are said to pursue and capture under water. Most of the species have little food value, but the hooded merganser (*Lophodytes cucullatus*) is said to feed upon roots and seeds and is thus a palatable table duck. The males are black and white, with a large, circular crest, giving them a peculiar and striking appearance; the adult female also has a crest, but it is small, grayish brown, tinged with cinnamon. (See Plate of North American Wild Ducks in article Duck.) The hooded merganser is the smallest of the North American species, only 1½ feet in length. The other two species, the goosander (*Merganser*, or *Mergus, americanus*) and the red-breasted merganser or sheldrake (*Merganser*, or *Mergus, serrator*), are nearly or quite 2 feet long, and have no true crest, though the feathers of the crown may be somewhat lengthened. The hooded and red-breasted mergansers are found in nearly all parts of the Northern Hemisphere, while the goosander is replaced in Europe by a very closely allied species (*Merganser*, or *Mergus, merganser*). All of these species breed in the northern portions of their range and winter southward almost to the tropics. About half a dozen other mergansers are known, one or two of which are South American.

MER′GER. 1. In the law of real property, the union of a lesser with a greater estate in the

same property in the same person, with the result that the lesser estate is obliterated by the larger estate. Thus, if one is a tenant for years or for life of real estate, and the estate of his landlord or the reversioner in fee comes to him either by descent or purchase, the tenancy is merged in the larger estate and the tenant becomes owner in fee. If, however, there be an intermediate estate, merger is prevented. Thus, if one be in possession of property as tenant for years, with remainder to another for life, and remainder to a third in fee, there will be no merger if the fee remainderman convey his estate to the tenant for years; but if the owner of the life estate convey to the tenant for years, or vice versa, the tenancy for years will merge in the life estate. Courts of equity will in many cases, where justice requires it, in effect prevent merger by compelling the owner of the estate to hold the property as though the two estates were distinct. Thus, for example, if a tenant of real estate in his own right purchased the reversion as trustee for another, a court of equity would compel him to continue to collect the rents from himself as tenant and to account to the beneficiary for them as trustee of the reversion. In the same manner when the legal estate in property becomes vested in one having an equitable claim with reference to the property, or an equitable estate as it is sometimes called, the equitable becomes merged in the legal estate and so disappears, unless kept alive for the purpose of furthering justice, when equity will treat the two interests as distinct notwithstanding the merger. Consult the authorities referred to under TRUSTS; MORTGAGE.

2. In the law of contracts, the acceptance of a higher security or obligation in lieu of a lower extinguishes the lower. Thus, rights upon contract are merged in a judgment secured in an action upon the contract. A simple debt merges in a promissory note given in its stead, and both merge into a bond or obligation under seal given in their place.

3. In the criminal law, the inclusion of a lesser crime in a greater and the sinking of private wrongs in public wrongs or crimes. Many greater crimes include lesser crimes, as an assault in committing robbery or homicide. The state may prosecute and punish either the greater or the lesser offense, but of course not both, since that would be putting a man twice in jeopardy for the lesser offense. In England, where criminal prosecutions are usually conducted by private persons, whenever a tort, as an assault or a libel, is also a crime, the private wrong is postponed to or merged in the public wrong, so that the injured party has no private remedy until after the conviction and punishment of the criminal. This does not generally hold in the United States, however. Consult the authorities under TORT.

4. The consolidation of the control of two or more corporations in a single corporation by the device of issuing the stock of the new corporation, known as the holding company, in exchange for a majority of the stock of the several corporations to be controlled. The several corporations to be controlled are then said to be merged in the single corporation holding their stock. The United States Supreme Court decided that the Northern Securities Company formed to hold the stock of the Great Northern and Northern Pacific Railway companies was an illegal combination in restraint of interstate commerce. See RESTRAINT OF TRADE, CONTRACTS IN; SHERMAN ACT.

MERGUI, mĕr-gē′. The capital of the Mergui Archipelago (q.v.).

MERGUI ARCHIPELAGO. A group of islands in the Bay of Bengal, along the coast of the Tenasserim division of Lower Burma, of which they form a part (Map: Burma, C 4). The islands, numbering about 800, are rocky and mountainous, some of them rising to 3000 feet above sea level, and are noted for their varied and picturesque scenery. The largest, King Island, has permanent habitations, but the others are inhabited by a race called Salons, or sea gypsies, who rove from island to island and subsist mainly by pearl fishing and collecting and selling edible birds' nests. Tin mines are worked in the south. Area of district, 9789 square miles; pop., 1901, 88,744; 1911, 111,424. Mergui, the capital of the district, with a heterogeneous population of 11,987 in 1901 and 14,889 in 1911, is situated on an island at the chief outlet of the Tenasserim River in the Bay of Bengal. It has an average rainfall of 103 inches. It is the centre of a pearl-fishing industry of considerable importance.

MERIAN, mā′rē-ȧn, MARIA SIBYLLA (1647–1717). A German painter and naturalist, born in Frankfort-on-the-Main, daughter of the engraver Matthäus Merian. She studied under Mignon and in 1665 married Johann Andreas Graff, a painter, and removed to Nuremberg. Though she was skillful in painting fruits and flowers, her taste led her particularly to natural history. Her exquisite taste, as well as the great precision which characterized her artistic work in botany and entomology, gained for her a high reputation in the scientific world of the time. In 1679 she published an excellent work on caterpillars, entitled *Erucarum Ortus, Alimentum et Paradoxa Metamorphosis.* In 1698 she went to South America and devoted herself to research on the natural history of Dutch Guiana, the result of which appeared in her *Metamorphosis Insectorum Surinamensium* (1705). There are two volumes of her drawings in the British Museum, one of the insects of Europe, the other of those of Dutch Guiana. There are collections in St. Petersburg, Amsterdam, and Frankfort.

MERIAN, MATTHÄUS, called THE ELDER (1593–1650). A Swiss engraver. He was born at Basel, studied under Dietrich Meyer, of Zurich, and afterward lived in Paris and Frankfort. He began in 1640 the famous Zeiller's *Topographia,* presenting perspective views of European cities, towns, and castles which were drawn, engraved, and described by himself. The work, which is regarded as extremely valuable, was continued after his death. For his biography, consult Eckardt (Basel, 1887).

MERICI, SAINT ANGELA. See ANGELA MERICI, SAINT.

MÉRICOURT, THÉROIGNE DE. See THÉROIGNE DE MÉRICOURT.

MÉRIDA, mā′rē-dȧ. The capital of the State of Mérida, Venezuela, situated about 60 miles south of Lake Maracaibo, on a plateau 5500 feet above sea level (Map: Colombia, C 2). It has a cool, moist climate, with an average temperature of 64.5° F. It has a cathedral and is the seat of one of the two universities of the Republic. Its chief manufactures are carpets, cotton and woolen goods; it exports coffee and preserved

fruits. Pop., municipal, 1891, 13,366; 1913 (est.), 16,000. Mérida was founded in 1558 by Juan Rodriguez Saurez. It has suffered much from earthquakes, notably in 1812 and 1894.

MÉRIDA. The capital of Yucatan, Mexico, situated on a barren plain in the northwestern part of the peninsula, 25 miles from the Gulf of Mexico (Map: Mexico, O 7). The town is regularly built, with fine streets, squares, and parks, and has a university, a cathedral completed in 1598, a government palace, a museum, various secondary schools, and a hospital. Among its manufactures are straw hats, cotton goods, soap, and leather, while great quantities of sisal grass are exported from here to the United States, as well as brandy, sugar, hides, indigo, and salt. Pop., 1910, 62,447. Mérida was founded in 1542 by Francisco Montejo, who was the conqueror of Yucatan.

MÉRIDA. A small town of southwest Spain, in the Province of Badajoz, situated on the right bank of the Guadiana, 30 miles east of Badajoz (Map: Spain, B 3). It is now an insignificant town, but contains numerous evidences of its ancient greatness. Among these are the remains of the Roman walls with five gates still preserved, a triumphal arch erected by Trajan, the ruins of an amphitheatre and of a Roman circus built to accommodate 20,000 spectators, some remains of a temple of Diana, and parts of an old reservoir and of two Roman aqueducts, as well as numerous columns, statues, and minor ruins. There is also a magnificent Roman stone bridge crossing the Guadiana by 64 arches and nearly half a mile long. Mérida was founded as a colony for Roman veterans (*emeriti*), and called *Augusta Emerita,* whence the present name is derived. It was made the capital of the Province of Lusitania, and later became the seat of the Visigothic archbishops. It remained an important town during the time of the Moorish domination until it was captured by Alfonso IX in 1228. Pop., 1900, 9124; 1910, 14,633.

MER'IDEN. A city in New Haven Co., Conn., 19 miles north-northeast of New Haven and 18 miles south-southwest of Hartford, on the New York, New Haven, and Hartford Railroad (Map: Connecticut, D 3). It is picturesquely situated, overlooked by the Hanging Hills on the northwest, and is drained by Harbor Brook. Meriden is one of the most prosperous industrial centres in New England. Among its manufactures are silver and plated ware, hardware, cutlery, steel pens, bronzes, brass castings, firearms, organs, self-playing attachments for pianos and organs, glassware, cut glass, curtain fixtures, electrical goods, gas, electric, and kerosene fixtures, screws, vises, and machinery. The city has the Connecticut School for Boys (reform), Meriden Hospital, Curtis Home for Orphan Children and Aged Women, a fine armory, and the handsome Curtis Memorial Library. Hubbard Park is a beautiful natural reservation of 900 acres, within the limits of which are the Hanging Hills, the highest point rising 1000 feet above sea level. Other attractions are Lake Merimere and Castle Craig.

The government, under a charter of 1897, is vested in a mayor, elected every two years, a bicameral council, and administrative officials, appointed or elected as follows: by the mayor—boards of apportionment and taxation, public works, and police, fire, and park commissioners; by the council—tax collector, plumbing inspector, fire marshal, boiler inspector, health officer, and board of compensation; by the people—clerk, treasurer, auditor, and sheriffs. The city owns and operates its water works. Pop., 1900, 24,296; 1910, 27,265; 1914, 28,528; 1920, 29,842. The city is included in the township of Meriden, the population of which in 1920 was 34,739. From 1725 until incorporated in 1806 as a town under its present name Meriden was a parish of Wallingford. In 1867 it was chartered as a city. Consult Perkins, *Historical Sketches of Meriden* (West Meriden, 1849), and G. M. Curtiss, *Century of Meriden* (Meriden, 1906).

MERID'IAN (Lat. *meridianus*, relating to midday, from *meridies*, for **medidies*, midday, from *medius*, middle + *dies*, day). Any great circle of a sphere passing through its poles. A *terrestrial* meridian is the intersection of the earth's surface made by a plane passing through the poles. The *prime* meridian is the one from which longitude is measured. The *celestial* meridian of any place on the surface of the earth is the great circle of the celestial sphere passing through the zenith and the celestial poles. The *magnetic* meridian at any point is the horizontal direction at the point of a freely suspended compass needle undisturbed by influences other than the earth's magnetic force. To distinguish the terrestrial or geographical meridian from the magnetic, the former is called the *true* meridian, as its direction is that of true north or south. It is evident from the explanation given that the so-called *magnetic* meridian is not a great circle of the earth, but merely a *direction* at a particular point. The lines joining the points of equal variation are not therefore coincident with the magnetic meridian; they are called isogonic lines, and, owing to the nonuniform character of the earth's magnetic force, these lines are very irregular curves. See MERIDIAN CIRCLE; MERIDIAN MEASUREMENT.

MERIDIAN. A city and the county seat of Lauderdale Co., Miss., 96 miles east of Jackson, on the Alabama and Vicksburg, the Alabama Great Southern, the Meridian and Memphis, the New Orleans and Northeastern, the Southern, and the Mobile and Ohio railroads (Map: Mississippi, H 6). It is the seat of the Meridian Female College (Methodist Episcopal), opened in 1869, the Meridian Male College, the Meridian Academy (Methodist Episcopal South), and Lincoln School (Congregational), the last two for colored students, and has the East Mississippi Insane Hospital, a Carnegie library, and fine courthouse and high-school buildings. The city has an extensive trade and is the most important manufacturing centre in the State. Its industries, represented by railroad machine shops, cotton, cottonseed-oil, and hosiery mills, lumber mills, mattress, broom, fertilizer, and harness factories, wagon works, stave mills, foundries, etc., had, in 1909, a production valued at more than $4,000,000. The city adopted the commission form of government in 1912. The water works, owned by the municipality, are valued at $700,000. In March, 1906, a tornado destroyed a large portion of the business district. Meridian was an important Confederate railway centre during the Civil War, and in February, 1864, General Sherman was sent against it. Arriving on the 14th, he remained unmolested until the 20th, destroying the railroads in the vicinity, also the large storehouses and many residences. Pop., 1900, 14,050; 1910, 23,285; 1914 (U. S. est.), 21,806; 1920, 23,399.

MERIDIAN CIRCLE. An instrument used for determining the meridian altitude or zenith distance of a star. It consists of an astronomical telescope firmly fixed to a graduated circle, which moves about a horizontal axis, resting on a pair of very solid supports. In the common focus of the eyepiece and object glass of the telescope is a system of fixed cross wires (spider lines are generally used for the purpose), one being horizontal and five or more vertical, with equal spaces between. An imaginary line passing through the optical centre of the object glass and the intersection of the horizontal and middle vertical wires is called the line of collimation of the telescope, and, when the instrument is in perfect adjustment, this line moves in the plane of the meridian. Besides the above-mentioned fixed wires there is a movable one, called a micrometer wire, which is moved by means of a screw, remaining always parallel to the fixed horizontal wire. If the instrument is in perfect adjustment, and if the image of a star, while passing across the middle vertical wire in the field of view, is at the same time bisected by the fixed horizontal wire, the star is at that moment in the line of collimation of the telescope. It is therefore at that moment in the meridian, and its meridian zenith distance is the angle through which the circle would have been turned from the position it had when the line of collimation of the telescope pointed to the zenith. There is a fixed pointer, for the purpose of approximately reading the instrument. If the instrument was adjusted so that the pointer was opposite the zero point of the circle, when the line of collimation of the telescope pointed to the zenith, the arc measured on the circle between these two positions of the instrument is the meridian zenith distance of the star.

Great nicety is required in reading the instrument, i.e., in determining exactly the arc through which the circle has moved in bringing the telescope from the vertical to any other position. The rim is usually graduated at intervals of five minutes; and the eye could determine only the division nearest to the fixed index. But by means of a reading microscope or micrometer (q.v.), fixed opposite to the rim, the portion of the interval to the nearest division on the rim can be read to seconds. There are sometimes six such microscopes fixed opposite different points of the rim; and the reading of the instrument is the mean of the readings of all the microscopes. This tends to eliminate errors arising from imperfect graduation and errors of observation. If the instrument is properly adjusted, the zero point of the circle will be opposite the fixed pointer when the line of collimation of the telescope points to the zenith. In practice, however, this is not always accurately, or even approximately, the case, and is really of no consequence, as the final result of every observation is the difference between two readings. It is evident that the difference between any two readings of the instrument will represent the angle through which the line of collimation of the telescope moves in passing from one position to the other. It remains to show how a fixed point, viz., the nadir (q.v.), is observed, and then how an observation is taken of the star itself on its meridian passage. It must be explained here that the fixed horizontal wire in the eyepiece of the telescope, in the instrument as now used, is only an imaginary line which determines the line of collimation of the telescope. It coincides with the position of the micrometer wire when the screw head of the micrometer marks zero.

To observe the nadir, a trough of mercury is placed underneath the instrument and the telescope is turned so as to look vertically downward into it. An image of the system of cross wires which is in the common focus of the object glass and eyepiece will be reflected back again to nearly the same focus. Looking into the telescope, the observer now adjusts it by means of a slow-motion screw till the reflected image of the horizontal wire coincides with the real one. The final adjustment is perhaps most delicately effected by turning the screw head of the micrometer, which moves the wire itself. When they coincide the line joining the centre of the object glass of the telescope with the intersection between the middle vertical and horizontal micrometric wires will be vertical. For that position of the movable wire the circle now gives the exact nadir reading, which differs by 180° from the true zenith reading.

Again, to observe a star in the meridian, the instrument is previously adjusted so that the star, in passing the meridian, shall pass over the field of view of the telescope. As the image of the star approaches the centre of the field the observer adjusts the telescope by the slow-motion screw, so as to bring the image of the star very nearly to the horizontal wire. Finally, just as the star passes the middle vertical wire, he bisects the image of the star with the horizontal wire by a touch of the micrometer screw head. The circle being now clamped, the reading is determined as before by reading the pointer and microscopes and adding or subtracting, as the case may be, the reading of the micrometer. This reading now subtracted from the zenith reading gives the meridian zenith distance of the star; and this, again, subtracted from 90°, gives its meridian altitude above the horizon. See TRANSIT INSTRUMENT.

MERIDIAN MEASUREMENT. The determination of the form and size of the earth from the measurement of a meridional arc has been a favorite problem with mathematicians from the earliest times, but up to the middle of the eighteenth century their operations were not carried on with exactness sufficient to render their conclusions of much value. Since that time, however, geodesy has progressed so rapidly, owing to the invention of more accurate instruments and the discovery of new methods, that the measurement of the meridian can now be performed with very high precision. The modus operandi is as follows: two stations, having nearly the same longitude, are chosen; their latitude and longitude are accurately determined (the error of a single second in latitude introduces a considerable error into the result) and the direction of the meridian to be measured ascertained; then a base line is measured with the greatest accuracy, as an error here generally becomes increased at every subsequent step; and then, by the method known as triangulation (q.v.), the length of the arc of the meridian contained between the parallels of latitude of the two stations is ascertained. As the previously found latitudes of its two extremities give the number of degrees it contains, the average length of a degree of this arc can be at once determined and also, on certain assumptions as to the earth's form, the length of the whole meridional circumference of the earth. This operation of meridian measurement has been

performed at different times on a great many arcs lying between lat. 68° N. and lat. 38° S., and the results show a steady though irregular increase in the length of the degree of latitude as the latitude increases. On the supposition that the law of increase holds good to the poles the length of every tenth degree of latitude up to 70° is as follows:

DEGREE OF LATITUDE	Length of degree in English feet
0°	362,756
10°	362,868
20°	363,188
30°	363,679
40°	364,284
50°	364,929
60°	365,536
70°	366,033

This table is calculated on the theory that the earth is not spherical, as in that case the length of all degrees of latitude would be alike, but of a more or less spheroidal form, i.e., having its curvature becoming less and less as we go from the extremity of its greater or equatorial diameter to the lesser or polar axis. See EARTH; DEGREE OF LATITUDE.

Meridional Parts. In preparing a chart (q.v.) upon Mercator's projection, in order to preserve the relative proportion between the lengths of meridians and parallels at any point the former must be increased in length. The lengths of small portions of the meridians thus increased are called *meridional parts*, and tables giving the lengths at different latitudes are prepared for use in constructing charts.

MERIGI DA CARAVAGGIO. See CARAVAGGIO, MICHELANGELO MERISI DA.

MÉRIMÉE, mā'rē'mā', PROSPER (1803–70). A French novelist, historian, dramatist, and critic, born in Paris, Sept. 28, 1803. He studied law, which he never practiced; he held various offices in the civil service, became, in 1831, inspector of archæological and historical monuments of France, an Academician in 1844, and a Senator of the Empire in 1853. His reports of professional researches were the basis of four volumes: *Dans le midi de la France* (1835); *Dans l'Ouest* (1836); *En Auvergne et Limousin* (1838); *En Corse* (1840). To archæology he contributed also *Monuments historiques* (1843); *Peintures de l'Eglise Saint-Savin* (1844); and to history a monograph on *Don Pedro de Castille* (1843), *Les faux Démétrius* (1854), and a volume of miscellaneous *Essais* (1855). He is best known, however, for his fiction, narrative and dramatic, *Théâtre de Clara Gazul* (1825), a pretended translation from the Spanish and an ironical toying with romanticism; *La Guzla* (1827), a pretended translation of Illyrian songs; *La Jacquerie* (1828), dramatic scenes from the Peasants' War of 1358; a similar but far finer historic study, *La chronique du règne de Charles IX* (1829), of which the Massacre of St. Bartholomew forms the central scene; *Colomba* (1840), his most popular novel, a story of Corsica; *Carmen* (1847), a Spanish gypsy romance and subject of a popular opera by Bizet; and three volumes of short stories of remarkable polish and artistic effect, but hard, ironical, and sometimes cynically pessimistic. Mérimée was, before Maupassant, an unapproached master of stylistic restraint and concision. He chooses exotic scenes, a material and moral life alike foreign to his readers, but he never fails to produce the illusion of reality even when he crosses the border of the supernatural. Although impassive in his writing, Mérimée was in private life characterized by tender and devoted friendships, of which his *Lettres à une inconnue* (1873), translated in the "Bric à Brac Series," edited by Stoddard, vol. 111, New York, 1874; the *Lettres à une autre inconnue* (1875); the *Lettres à Panizzi* (1881); and *Une correspondance inédite* (1896), are most interesting and beautiful monuments. They show Mérimée gracious, affectionate, loyal, capable of even a romantic idealism. Mérimée died at Cannes, Sept. 23, 1870. Consult: *Writings of Prosper Mérimée, with Essay on the Genius and Achievement of the Author*, by George Saintsbury (8 vols., New York, 1905 et seq.); also Tourneux, *Prosper Mérimée, ses portraits, ses dessins, etc.* (Paris, 1879); Haussonville, *Mérimée* (ib., 1888); Augustin Filon, *Mérimée et ses amis* (ib., 1894); id., *Mérimée* (ib., 1898); F. Chambon, *Notes sur Mérimée* (ib., 1903); L. Pinvert, *Sur Mérimée* (ib., 1908); also W. H. Pater, in *Studies in European Literature* (Oxford, 1900).

MERINO, me-rē'nô. See SHEEP.

MER'ION'ETH. A county of Wales, bounded west by Cardigan Bay and north by the counties of Carnarvon and Denbigh (Map: Wales, C 4). Area, 660 square miles. Its coast line is generally rugged. Merioneth is the most mountainous county in Wales, with valley, cliff, and lake alternating. The highest point is less than 3000 feet. Large tracts are unfit for profitable cultivation. Slate and limestone are largely quarried, and lead, copper, and manganese are mined. Woolens and flannels are manufactured. Capital, Dolgelly (q.v.). Pop., 1901, 48,852; 1911, 45,565.

MER'ISTEM (irregular formation from Gk. *μεριστός, meristos*, divided, from *μερίζειν, merizein*, to divide, from *μέρος, meros*, part). A general name applied in the anatomy of plants to actively dividing tissue. For example, in most stems meristem occurs at the apex and gives rise to the stem tissues. In stems which increase annually in diameter there is a very characteristic meristem, called cambium (q.v.), that produces the wood elements. A young organ, such as a leaf which is developing, is usually completely meristematic. The contrasting term to "meristematic tissue" is "permanent tissue." See HISTOLOGY.

MERIT, ORDER OF. An order instituted in London, June 26, 1902, by King Edward VII, with the object of conferring distinction on persons who have gained prominence in military, scientific, artistic, and professional services. The order consists of the sovereign and the members and is not conferred as a reward for political services. Initials of the order are accorded precedence immediately after those of the Bath and before the other orders of knighthood. On Jan. 1, 1915, there were 15 members, comprising, as representative of the army, Earl Kitchener; of the navy, Admirals Seymour and Wilson and Lord Fisher; of science, Lord Raleigh, Sir William Crookes, Sir Archibald Geikie, and Sir Joseph J. Thomson; of literature and history, Viscount Bryce, Viscount Morley, Lord Cromer, Thomas Hardy, Sir George Trevelyan, and Prof. Henry Jackson; of music, Sir Edward Elgar. Honorary members of the order were

Marquis Yamagata, Marquis Oyama, and Admiral Count Togo.

MERIT SYSTEM, The. In the United States the merit system looks towards the appointment of men to office because of their competency and not because of their political opinions. The fitness of the candidate is determined by his ability to pass a written competitive examination given by a commission of examiners. The answers submitted by candidates must be unsigned, so as to obviate the possibility of favoritism on the part of the examiners. A list is made of the successful candidates, arranged in the order of their merit as shown by the results of the examination. Appointments must be made from this eligible list in the order of rank unless good cause can be shown why one of higher rank should be set aside for one standing lower on the list. A common objection to the merit system is that it does not give an adequate test of a man's real capacity to administer the office to which he seeks appointment. This is in a measure true, though more and more the civil-service examiners are coming to lay stress upon experience and practical knowledge. Inasmuch as the merit system makes it more difficult for the ordinary political heeler to secure lucrative offices because of his vote-getting ability, the system must be recognized as a power for good. Though it does not inevitably lead to the choice of the most competent, it does very effectually exclude the absolutely unfit. The existence of a merit system has exerted a considerable influence even upon what are still legally political appointments. Considerations of fitness play a far more important part than formerly in determining appointments to responsible positions, especially in the larger cities. See Civil-Service Reform.

MERIVALE, mĕr′ĭ-vāl, Charles (1808–93). An English historian, best known by his work on the Roman Empire. He was born March 8, 1808, the son of John Herman Merivale, a well-known minor poet. He was educated at Harrow, Haileybury College, and St. John's College, Cambridge. He took his degree at the latter place in 1830, and was successively scholar, fellow, and tutor. During all this time he was interested especially in Roman history, and between 1850 and 1864 wrote his well-known *History of the Romans under the Empire*, which deals with the period between the rise of the Gracchi and the death of Marcus Aurelius. The first part of the work was especially popular and was published in popular form under the title of *The Fall of the Roman Republic.* The merit of this history was great in its day, but more recent investigation, especially the study of epigraphy, has controverted many of Merivale's views. In 1869, after declining an appointment to the professorship of modern history at Cambridge, he became dean of Ely, though he had only a slight interest in strictly ecclesiastical questions and disputes. He continued to publish various studies on Roman history, among which may be noted *General History of Rome from the Foundation of the City to the Fall of Augustulus* (1875). In 1862 he very successfully translated Keats's *Hyperion* into Latin verse. He died Dec. 27, 1893. Consult *Autobiography and Letters*, edited by his daughter, Judith Anne Merivale (London, 1899).

MERIVALE, Herman (1806–74). An English economist and administrator, born at Dawlish, Devonshire. He was a brother of Charles Merivale, the historian, studied at Harrow, and graduated at Trinity College, Oxford, in 1827. In 1832 he was called to the bar of the Inner Temple. From 1837 to 1842 he was professor of political economy at Oxford, delivering while there a valuable series of *Lectures on Colonization and the Colonies* (2 vols., 1841–42). Appointed Assistant Undersecretary of State for the Colonies in 1847, he became permanent Undersecretary in 1848. He was transferred in 1859 to the undersecretaryship for India and continued in that office until his death. His further works—none of his books, it is said, well represents him—include *Historical Studies* (1865); *Memoirs of Sir Philip Francis* (1867); the second volume of a *Life of Sir Henry Lawrence* (1872).

MERIVALE, John Herman (1779–1844). An English scholar, translator, and poet. He was born in Exeter, studied at St. John's College, Cambridge, and was called to the bar in 1804. He contributed largely to Bland's *Collections from the Greek Anthology*, published in 1813, and himself brought out a second edition in 1833. From 1831 to his death he held the office of Commissioner of Bankruptcy. Among his further literary works may be mentioned *Poems, Original and Translated* (1841) and *Minor Poems of Schiller* (1844). He was the father of Charles and Herman Merivale.

MER′IWETH′ER, Lee (1862–). An American lawyer and author, born at Columbus, Miss. He was educated at Memphis, Tenn., studied law, and practiced his profession at St. Louis. The Secretary of the Interior appointed him, after he had taken a tramp trip across Europe in 1885–86, to write a report on the condition of the laboring classes in Europe. Subsequently, as a special agent of the Department of the Interior, he was active in collecting statistics regarding labor in the Hawaiian Islands and the United States. This post he resigned to accept that of Labor Commissioner of Missouri. He made himself known by his report on the corporation (or "truck") store system, by which miners in Missouri were provided with supplies, at exorbitant figures, as a substitute for the regular wages, and he introduced into the Legislature of the State a bill which put an end to this system. Later he studied European prisons, and upon his return to the United States resumed the practice of law in St. Louis. He was the candidate of the Public Ownership party for mayor of St. Louis in 1901 and 1905. His publications include: *A Tramp Trip: How to See Europe on Fifty Cents a Day* (1887), describing a pedestrian journey taken by him from Gibraltar to the Bosporus in 1885–86; *The Tramp at Home* (1889); *Afloat and Ashore on the Mediterranean* (1892); *Miss Chunk* (1899); *A Lord's Courtship* (1900); *Seeing Europe by Automobile* (1911).

MERKEL, mĕr′kel, Adolf (1836–96). A German jurist and criminologist, born in Mainz and educated at Giessen and Heidelberg. He became docent at Giessen in 1862 and professor in 1867, and was successively appointed professor at Graz (1868), at Vienna (1872), and at Strassburg (1874). He contributed largely to Holtzendorff's *Handbuch des deutschen Strafrechts* and *Encyklopädie der Rechtswissenschaft* and wrote *Zur Lehre vom fortgesetzten Verbrechen* (1862); *Kriminalistische Abhandlungen* (1867); *Juristische Encyklopädie* (1885; 3d ed., by R. Merkel, 1904); *Lehrbuch des deutschen Straf-*

rechts (1889); *Vergeltungsidee und Zweckgedanke im Strafrecht* (1892); and other essays on criminal law.

MERLE, mĕrl (OF., Fr. *merle*, from Lat. *merula*, blackbird). The common European blackbird (*Turdus merula*), a thrush closely allied to the American robin, the male of which is uniformly black, while the female is dusky olive brown above and reddish brown below. The species is migratory except on the borders of the Mediterranean, and is one of the most familiar of the summer birds of Europe, coming about all gardens and roadsides and making its rude nest in bushes and hedgerows. The eggs are bluish green freckled with brown. This is one of the finest of European songsters and is frequently kept in cages and aviaries. The genus is a large one, with numerous species in the Orient, Australia, and South America. Compare BLACKBIRD; THRUSH.

MERLE D'AUBIGNÉ, mârl dō'bē'nyā', JEAN HENRI (1794–1872). A Swiss historian. He was born at Eaux-Vives, a suburb of Geneva, in Switzerland, Aug. 16, 1794; studied there and at Berlin, and in 1818 became pastor of the French Protestant Church in Hamburg. Thence, after a residence of five years, he proceeded to Brussels. In 1831 he returned to Geneva and took part in the institution of a new college for the propagation of orthodox theology, in which he was appointed professor of Church history. His *Histoire de la réformation au seizième siècle* gave him a wide reputation and has been translated into many languages. It is, however, marred by partisanship and uncritical use of authorities. The first part, that on the Reformation in the time of Luther (4 vols., Paris, 1835–47; best ed. of the Eng. trans., 5 vols., Edinburgh, 1853, the last volume on the English Reformation), was vastly more popular than the second part, that on the Reformation in the time of Calvin (8 vols., 1862–78; Eng. trans., 8 vols., London, 1863–78). His other writings, mostly historical, are of less account. He died at Geneva, Oct. 21, 1872. Consult his *Life* by Bonnet (Paris, 1874).

MERLET, mâr'lā', LUCIEN VICTOR CLAUDE (1827–98). A French antiquary, born at Vannes. He studied paleography and in 1851 became head of the departmental archives of Eure-et-Loir. He edited many chartularies and ecclesiastical registers and published: *Histoire des relations des Hurons et des Abnaquis du Canada avec Notre-Dame de Chartres* (1858); *Robert de Gallardon: scènes de la vie féodale au XIIIème siècle* (1858); *Dictionnaire topographique du département d'Eure-et-Loir* (1861); *De l'instruction primaire en Eure-et-Loir avant 1789* (1878); *Dictionnaire des noms vulgaires des habitants de diverses localités de la France* (1883); *Poètes beaucerons antérieurs au XIXe siècle* (1894); *Inventaire sommaire des archives dèpartementales d'Eure-et-Loir* (1894); *Dalles tumulaires et pierres tombales du département d'Eure-et-Loir* (1895); *Cartulaire de l'abbaye de la Madeleine de Châteaudun* (1896); *Dignitaires de l'église Notre Dame de Chartres* (1901).

MER'LIN. An opera by Goldmark (q.v.), first produced in Vienna, Nov. 19, 1886; in the United States, Jan. 3, 1887 (New York).

MERLIN. The name of an ancient British prophet and magician who flourished, according to the romancers, during the decline of the native British power in its contest with the Saxon invaders. The earliest traces of him are found in the *Historia Britonum*, ascribed to a certain Nennius (about 800). He there appears as a prophetic child under the name Ambrosius, and is confounded with Aurelius Ambrosius, to whom Vortigern surrenders Mount Heremus (Snowdon). He next appears in Geoffrey of Monmouth's *Vita Merlini*, afterward incorporated in the *Historia Regum Britanniæ* (about 1139), where he is called Merlin Ambrosius, or simply Merlin. Geoffrey expanded the narrative of Nennius, evidently employing for the purpose traditions concerning a Cambrian or Welsh bard known in Welsh legend as Myrddin. According to Geoffrey, Merlin lived in the fifth century and was sprung from the intercourse of a demon and a Welsh princess. Merlin displayed miraculous powers from infancy. He is made to predict the history of Britain down to Geoffrey's own time. From Geoffrey and other sources was built up the French prose romance of Merlin (thirteenth century). Versions of this romance were made in Italian, Spanish, German, and English; and parts of it were embodied in Malory's *Morte d'Arthur* (1485). A collection of prophecies attributed to him appeared in French (Paris, 1498), in English (London, 1529 and 1533), and in Latin (Venice, 1554), and their existence is traceable as far back as the thirteenth century. Besides this Cambrian Merlin (Merlin Ambrosius) there is the Strathclyde Merlin, called Merlin the Wyllt, or Merlin Caledonius. He is supposed to have lived in the sixth century, a contemporary of St. Kentigern, Bishop of Glasgow. His grave is still shown at Drummelzier on the Tweed, where, in attempting to escape across the river from a band of hostile rustics, he was impaled on a hidden stake. A metrical life of him, extending to more than 1500 lines, professedly based on Armoric materials, and incorrectly ascribed to Geoffrey of Monmouth, was published by the Roxburghe Club in 1833. His prophecies, published at Edinburgh in 1615, contain those ascribed to the Cambrian Merlin.

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MERLIN (OF. *esmerillon*, *emerillon*, Fr. *émerillon*, merlin, augmentative form from ML. *smerillus*, *smerlus*, merlin, probably from Lat. *merula*, blackbird). The smallest of Old World falcons (*Falco æsalon*, or *regulus*), scarcely exceeding a blackbird in size, but very bold and powerful. It is bluish ash in color above, reddish yellow on the breast and belly, with longitudinal dark spots, the throat of the adult male white. It builds its nest on the ground and is fond of localities where large stones are plentiful, whence it is often called stone falcon. It is common in most parts of Europe, Asia, and

Africa, and was of great repute in the days of falconry. The merlin is represented in North America by the pigeon hawk (q.v.).

MERLIN, mĕr'lăn', Antoine Christophe (1762–1833). A French revolutionist, born at Thionville. He studied theology and law and became an advocate at the parlement of Metz in 1788. He was sent as a deputy for Moselle to the Legislative Assembly of 1791, and in that body upheld the confiscation of the property of the émigrés and urged the execution of Louis XVI. He was elected to the National Convention in 1792, and, sent in the same year to defend Mainz, accomplished his task with notable success. He participated in the reaction against his former colleagues, the Jacobins; and under the Directory he sat in the Council of Five Hundred until 1798. He then became Director General of Posts, but lived in retirement under the Consulate and the Empire. He is often referred to in French history as Merlin of Thionville to distinguish him from Merlin de Douai (q.v.), with whom he was closely associated.

MERLIN COCCAI, mĕr-lēn' kō-käy', pseudonym of Teofilo Folengo (1491–1544). Greatest of Italian macaronic poets. At the age of 18 he became a member of the Benedictine Order, and while a monk he wrote Latin verses in the style of Vergil. About 1515 he forsook monastic life and wandered about the country with a young woman of good family, Girolama Dieda, often in great poverty, for he had no resource but his poetic talent. His first publication was the mock heroic *Baldus* (Venice, 1517 and 1521), written in macaronic verse (q.v.), which Folengo was the first to use with genius. Specimens of macaronic poetry are found in England in the thirteenth century (*Carmina Burana*), in the French *Roman de Renard* (thirteenth century), and in a German Goliardic poem of the fifteenth. It occurs frequently in the French farces of the fifteenth century (in parodies of church sermons), which, like the French epics, were popular in Italy. From Padua, in fact, in 1490, came the *Macaronea* of Tifi Odasi (Michele di Bartolomeo degli Odasi), a rippling satire of local types, which, giving this culinary name to poetry of the kind, had an immediate following. The anonymous *Nobile Vigonze Opus* (1494) is likewise of Padua and directly from the university. Of the same year is the *Virgiliana* of Fossa da Cremona, which was followed (1499) by the political invectives of Bassano da Mantua and Giovan Giorgio Alione d'Asti. In 1505 Serafino Buffone addressed a macaronic epistle to Isabella d'Este. Marin Sanudo cites some macaronic hexameters from as early as 1483. From this rich tradition Folengo drew the inspiration and the method for his famous *Baldus*, which probably influenced Rabelais in his creation of Pantagruel, and which, as a satire of the chivalric romance, is a predecessor of Cervantes' *Don Quixote*. A serious artistic and moral purpose guides Folengo not only here but in his following *Zanitonella, Orlandino,* and *Moschea*. He reduced his Latinization of a curious jargon composed of Venetian, Bergamasque, and Tuscan elements to rules in the *Normula Macaronica de Sillabis*. His *Chaos del triperuno* is, historically, more interesting still from its curious portrayal of the confused state of mind of the time in the midst of conflicting religious and scientific tendencies. Folengo issued from it about 1527 with a chastened spirit and, resuming monastic life, seems to have devoted the rest of his days to the production of religious works, such as the *Palermitana a umanità di Cristo* and the play *Atto della pinta*. Among the many imitators of Folengo the most important is Cesare Orsini of the following century (*Capriccia macaronica*, Venice, 1638). Consult *Works*, edited by Renier-Luzio (4 vols., Bari, 1911), and relative articles in *Giornale Storico della Letteratura Italiana* (Turin, 1911–12).

MERLIN DE DOUAI, mâr'lăn' de dōō'ā', Phillipe Antoine, Count (1754–1838). A French politician and jurist. He was born at Arleux and studied at the College of Anchin. He began his career by practicing law at Douai. In 1775 he became advocate at the parlement of Flanders, where he soon acquired reputation as an able lawyer. His frequent contributions to the law dictionary, of which he finally became the editor (5th ed., 1827–30), then appearing under the title *Répertoire universel de jurisprudence*, increased his reputation and established his authority as a jurisconsult. After the outbreak of the Revolution he was elected a member of the National Assembly (1789), where he attracted much attention by his report on the bill of April 4, 1789, abolishing the feudal system. In 1795 he became Minister of Justice and kept this post till Jan. 18, 1799. After the coup d'état of the 18th Brumaire he took the office of procureur général at the Court of Cassation (1801), and Napoleon made him Councilor of State in 1808, and two years afterward created him Count and Grand Officer of the Legion of Honor. By a royal ordinance of July 24, 1815, he was expelled from France and resided in Belgium and Holland. On his return to France in 1830 he became a member of the Academy of Moral and Political Science. He is the author of *Recueil alphabétique des questions de droit qui se présentent le plus fréquemment dans les tribunaux* (4th ed., 1827–28).

MER'LON (Fr. *merlon*, It. *merlo;* perhaps connected with Lat. *mœrus, murus,* wall). In fortification, the portion of the parapet between two embrasures.

MER'MAID (from *mere,* AS. *mere,* Goth. *marei,* OHG. *mari,* Ger. *Meer,* OIr., Gael. *muir,* OChurch Slav. *morye,* Lat. *mare,* sea + *maid,* AS. *mægþ,* Goth. *magaþs,* OHG. *magad,* Ger. *Magd,* maid). An imaginary inhabitant of the sea. The upper parts of mermaids are represented as resembling those of beautiful women, while the body terminates in a tail like that of a fish. The *merman* is also heard of, but less frequently. The commonest representation of the mermaid pictures her as holding in her hand a mirror, while in the act of combing her hair. There is an evident affinity between the stories concerning mermaids and those concerning the sirens and tritons, perhaps also the nereids, of the ancients. All these stories may have had their origin in the play of the imagination about such sea creatures as seals and walruses dimly or distantly seen.

MERMAID, The. A famous London club, the foundation of which is ascribed to Sir Walter Raleigh. Its members included Jonson, Beaumont, Fletcher, Selden, and Carew. Shakespeare also is said to have belonged to it. The meeting place was the old Mermaid Tavern on Bread Street.

MERMAID'S GLOVE. A local English name applied to a sponge (*Halichondria oculata*) often cast ashore on the coast of Great Britain

and northeastern America. Its branches are somewhat finger-shaped, giving to the entire animal a rude glovelike appearance. The name is also given to a social polyp, *Alcyonium digitatum*, more aptly and commonly called dead-man's-fingers.

MERMAID'S HEAD. The popular British name for a spatangoid sea urchin (*Amphidetus cordatus*).

MERMAID'S PURSE. A shark's egg case. See RAY.

MERMET, mĕr'mȧ', JOSEPH (?1783–1836). A Canadian poet. He was born in France, was educated to be a soldier, and in 1813 went to Canada as lieutenant and adjutant of the well-known De Watteville regiment, made up chiefly of Swiss officers and soldiers. This regiment did notable service on the British side in the War of 1812. Mermet was for a time stationed at Kingston, Upper Canada, and while there wrote a considerable part of his poetry. His chief themes were inspired by the war, and especially the exploits of Colonel de Salaberry, the victor of Châteauguay. He afterward traveled through Canada and wrote poetic descriptions of its scenery. He was the first Canadian poet to choose Niagara Falls as a subject. In 1816 he returned to France. Mermet, though not a poet of great distinction, had considerable influence in stimulating the ambitions of the French-Canadian writers in the early part of the nineteenth century. Much of his verse had a light, satirical vein. His poems were published in *Le Spectateur* of Montreal.

MERMILLOD, mĕr'mē'lô', GASPARD (1824–92). A Swiss Roman Catholic prelate, whose ecclesiastical history is largely the story of the quarrel between the radical government of Geneva in the seventies and the holy see. He was born in Carouge, studied in a Jesuit college at Freiburg, and took holy orders in 1847. He was an impassioned orator and a leader of the Ultramontanists, in whose behalf he founded *L'Observateur Catholique* and the *Annales Catholiques*. In 1857 he was appointed vicar-general of Geneva and in 1864 received full episcopal powers in the canton. In the struggle precipitated by this action the Genevan government exiled him in 1873. An attempt on the Pope's part in 1879 to restore him was unsuccessful, as the brief forming the Canton of Geneva into an apostolic vicarate was still in force; but in 1883 Mermillod was appointed Bishop of Lausanne and Geneva, and the distasteful title was thus abrogated and the decree of exile consequently withdrawn. He was made Cardinal in 1890. In 1885 he founded the Union Catholique d'Etudes Sociales et Economiques. His best-known work is *Lettres à un Protestant sur l'autorité de l'église et le schisme* (1860). His collected works, sermons, lives of the saints, and political pamphlets were published in Paris and Lyons in 1893. Consult Lesur and Bournand, *Le Cardinal Mermillod* (Abbeville, 1895).

MERNEPTAH. See MENEPTAH.

MERÖ, mā'rē, YOLANDA (1887–). A Hungarian pianist, born at Budapest. Her first instruction she received from her father, after which she completed her pianistic studies with Madame Rennebaum, a pupil of Liszt. Twice, in 1900 and 1902, she won musical scholarships from the Minister of Education. Her début occurred at Dresden in 1904, with gratifying success. She then made tours of Germany, France, Holland, and England. At her American début, in 1909, with the Russian Symphony Orchestra, she made such a decided impression that she was immediately engaged by the great symphony orchestras of the country. Her playing is characterized by warmth and brilliancy. In 1909 she was married to Herman Irion, of New York.

MERODACH, mē'rô-dăk. The Hebrew pronunciation of the name of Marduk, or Maruduk, the great Babylonian god. It occurs in Jer. l. 2, in the proper names Merodach Baladan, which stands for Marduk apal iddin, and Evil Merodach, which represents Amil Marduk, and probably also in Mordecai in the Book of Esther. The same god is clearly intended in Isa. xlvi. 1, Jer. li. 44, where Bel is used, and also in the deuterocanonical fragment Bel and the Dragon (q.v.).

MÉRODE, mȧ'rôd', FRANÇOIS XAVIER MARIE FRÉDÉRIC GHISLAIN, COUNT DE (1820–74). A Roman Catholic prelate. He was born at Brussels, a grandnephew of Lafayette. He entered the Belgian army and took part in the Algerian campaign. In 1847 he began the study of theology at Rome, where he was ordained to the priesthood in 1850. Pius IX made him his chamberlain and canon of St. Peter's. In 1860 he was appointed temporary Minister of War and recruited, chiefly from foreigners, a Pontifical army. In 1865 he went out of office in consequence of a dispute with Cardinal Antonelli. The next year he was made Archbishop of Mytilene and Papal Almoner. In 1869 he resisted the declaration of the doctrine of papal infallibility, but he acquiesced in the final enunciation of it by the Ecumenical Council. Consult his *Life* by Lamy (Louvain, 1874) and by Besson (Paris, 1886).

MERO DE ALTO. See JEWFISH.

MEROË, mĕr'ō-ē (Lat., from Gk. Μερόη). The second capital of ancient Ethiopia (q.v.), dominant from the reign of King Ergamenes (c.250 B.C.), and the only residence of the kings after the downfall of Napata (q.v.). As Berua it is mentioned as early as 500 B.C.; the extensive ruins (described by Cailliaud, and finely illustrated in Lepsius, *Denkmäler*, part v) are situated at a place now called Begerawieh. Consult: Cailliaud, *Voyage à Méroé* (Paris, 1823–27); Lepsius, *Letters from Egypt, Ethiopia, and the Peninsula of Sinai* (London, 1853); Budge, *The Egyptian Sudan* (ib., 1907).

ME'ROM, WATERS OF. The scene of the great battle between the Hebrews under Joshua and the allied kings of Canaan (Josh. xi.). The Waters of Merom have been identified with the more northern of the two lakes through which the Jordan flows in its course to the Dead Sea. This lake is now called Huleh, or more fully Baheiret el Huleh (the little lake of Huleh). It is triangular in shape; at its base, towards the north, the Jordan enters and flows out again from its apex towards the south on its descent to the Sea of Galilee. The falling rains and melting snows periodically increase its size, but its average length is about 3½ miles and its width at the broadest point about 3; its depth is 10 to 16 feet. Schmidt supposes that we should read Merom for Darom in Deut. xxxiii. 23, since Naphtali had nothing to do with Darom (the south), while it seems to have possessed the places on Lake Merom. Josephus calls the lake Semechonitis (*Wars*, iii–x, 7), and the region about it Ulatha (*Ant.* xv, 10, 3).

The district, which is very fertile, is inhabited by Arabs. Consult: Macgregor, *The Rob Roy on the Jordan* (New York, 1870); G. A. Smith, *Historical Geography of the Holy Land* (London, 1895); Schmidt, *The Messages of the Poets* (New York, 1911).

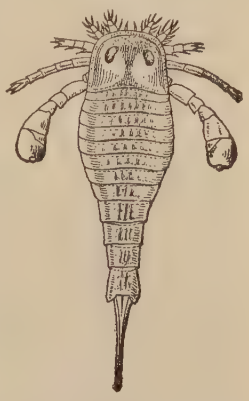
MEROPE, mĕr′ō-pē. 1. A sister of Phaëthon and one of the Heliades. 2. One of the Pleiades, the wife of Sisyphus and mother of Glaucus. She hid her light for shame because she had married a mortal. (See LOST PLEIAD, 1.) 3. The daughter of Cypselus and wife of the Messenian King Cresphontes. All her sons except Æpytus were killed when her brother-in-law, Polyphontes, seized the kingdom. Æpytus fled, and when he had grown up returned and put Polyphontes to death and regained the sovereignty.

MÉROPE, mȧ′rôp′. A tragedy by Voltaire (1743).

MEROP′ODA (Neo-Lat., from Gk. *μέρος, meros,* a part, a segment + *πούς, ποδός, pous, podos,* a foot). The name given by Packard to a phylum or general group of arthropodous animals comprising three classes, i.e., the diplopod Myriapoda (q.v.), or thousand legs, the Pauropoda, and the Symphyla. It is equivalent to the *Tracheata progoneata* of Pocock. In the typical forms (Diplopoda) the second pair of mouth appendages, corresponding to the mandibles of insects, are very different in structure and composed of three segments, since all the head and thoracic appendages are made up of several joints; hence the name *Meropoda,* or jointed legs. In this phylum all the forms agree in having the genital outlets situated a little behind the head; i.e., in diplopods and pauropods in the third segment behind the head, while in the Symphyla (*Scolopendrella*) the single opening is in the fourth segment from the head. The young on hatching differ from those of centipedes (Chilopoda) in having but three pairs of legs, but, unlike those of insects, either the third or the second trunk segment in diplopods is footless. See CENTIPEDE; MYRIAPODA.

MER′OSTOM′ATA (Neo-Lat. nom. pl., from Gk. *μέρος, meros,* part + *στόμα, stoma,* mouth). A class of Arthropoda, standing next above the Trilobita and immediately below the Arachnida, these three classes forming a series by themselves and distinct from the Crustacea. They are represented by the king crab (q.v.), or *Limulus,* the sole surviving member of the class. The merostomes are subdivided into three orders: the Eurypterida, represented by *Eurypterus;* the Synziphosura, of which three Paleozoic families are the types; and, third, the Xiphosura, type *Limulus.* The class chiefly differs from Trilobita in having appendages of two types, those of the head being single, those of the abdomen being biramous; in being provided with book gills, attached to the broad abdominal legs, which are fused together at the base, the head appendages often ending in a forceps, while they differ from the Arachnida in breathing by gills, all the forms being marine, in the nature of the appendages, the brain, the nervous cord enveloped by arteries, and by the reproductive organs. The earliest forms are the Eurypterida. The typical genus *Eurypterus,* unlike the king crab, probably swam actively nearer the surface of the sea. The species are found fossil in rocks of Cambrian to Permian age. The form of the body is somewhat like that of a scorpion, though flatter and of larger size. A quadrate headpiece or cephalothorax with rounded front corners bears two large reniform compound eyes, between which are two small eye spots or ocelli. The abdominal portion consists of 12 segments that taper posteriorly and are terminated by a strong, sharp spine or telson. The structure of the ventral surface of the body is quite similar to that of the horseshoe crab.

The eurypterids appeared first in the Potosi Cambrian limestones of Missouri. At the end of the Silurian period geographic conditions seem to have favored their development, for they expanded rapidly and became the dominant types of the fauna of the inclosed basins in which were deposited the shallow-water passage beds between the Silurian and Devonian formations. They appear in great numbers in the water limestones or cement rocks of New York State, and in beds of equivalent age and similar character in Great Britain and the Baltic Provinces; also in the coal measures of Carboniferous age in Pennsylvania, Nova Scotia, and in Europe, where they are associated with the fossil remains of a swamp fauna and flora. The last member of the genus is known from Permian freshwater beds of Portugal. The genus seems to have been first a marine shallow-water organism and to have changed its habitat through brackish and possibly to fresh water in succeeding geological periods. Several allied genera are found associated with the remains of *Eurypterus;* of these *Pterygotus, Slimonia,* and *Stylonurus* are the most important. See the articles KING CRAB; XIPHOSURA.



EURYPTERUS FISCHERI.

Consult: Woodward, *Monograph of the British Fossil Crustacea of the Order Merostomata* (Palæontological Society, London, 1866–78); A. S. Packard, "On the Carboniferous Xiphosurous Fauna of North America," in the *Memoirs of the National Academy of Sciences,* vol. iii (Washington, 1886); K. A. von Zittell, *Text-Book of Paleontology,* translated by C. R. Eastman (New York, 1900); with the writings of De Kay, Hall, Huxley, Salter, Peach, and Laurie.

MER′OVIN′GIANS. The first dynasty of the Frankish kings in Gaul. The name is derived from Merovæus, or Merovech, the reputed grandfather of the great Frankish King Clovis (q.v.), who in 486 put an end to the Roman dominion in Gaul. Clovis on his death divided his Kingdom among his four sons, one of whom, Clotaire I, reunited them under his own sway in 558. On his death in 561 the Kingdom was again divided into four parts—Aquitaine, Burgundy, Neustria, and Austrasia. His grandson, Clotaire II, again reunited them in 613. Later there were again three states, Neustria, Austrasia, and Burgundy, which were united in 687. The power of the Merovingian kings was finally reduced to a shadow, the real power having passed into the hands of the major domus (q.v.). The dynasty of the Merovingians terminated with the deposition of Childeric III by Pepin

the Short (q.v.) in 751 and gave place to that of the Carolingians (q.v.). (See FRANKS.) The chief authority of the earlier parts of the history of the Merovingians is Gregory of Tours. Consult: Thierry, *Récits des temps mérovingiens* (2d ed., Paris, 1887); Havet, *Questions Mérovingiennes* (2d ed., ib., 1896); Pron, *La Gaule Mérovingienne* (ib., 1897); Sergeant, *The Franks* (New York, 1898); Mariguan, *Etudes sur la civilisation Française*, vol. i (Paris, 1899).

MER'RIAM, AUGUSTUS CHAPMAN (1843–95). An American classical scholar, born at Locust Grove, N. Y. In 1866 he graduated with the highest honors from Columbia College, and from 1868 until his death he was connected with his alma mater as tutor, adjunct professor of Greek, and professor of Greek archæology and epigraphy. He was the pioneer in the study of classical archæology in the United States. In 1886 he served as president of the American Philological Association. He was director of the American School of Classical Studies at Athens in 1887–88, during which year important excavations were carried on at Icaria (q.v.). He died while on a visit to Athens and was buried there. His chief publications are: *The Phæacians of Homer* (New York, 1880); *The Greek and Latin Inscriptions on the Obelisk Crab in Central Park* (1883); *The Sixth and Seventh Books of Herodotus* (New York, 1885); *The Law Code of Gortyna in Crete* (ib., 1886); "Telegraphy among the Ancients," in *Papers of the Archæological Institute of America: Classical Series III* (Cambridge, 1890).

MERRIAM, CLINTON HART (1855–). An American biologist, born in New York City and educated at Sheffield Scientific School of Yale (1877) and at the College of Physicians and Surgeons (Columbia), where he graduated in 1879. He served as naturalist to the Hayden Survey in 1872, was appointed assistant of the United States Fish Commission in 1875, and acted as one of the Bering Sea commissioners in 1891 and as head of various expeditions. From 1885 to 1910 he was chief of the Biological Survey, which he developed as a bureau of the United States Department of Agriculture; and he edited a long and important series of publications relating to the fauna of North America, in the classification of which he became a leading authority. In 1910 he took charge of the biological and ethnological investigations carried on under the trust fund established by Mrs. E. H. Harriman. Among his published works are: *The Birds of Connecticut* (1877); *Mammals of the Adirondacks* (1882–84); *Biological Reconnaissance of Idaho* (1891); *Geographic Distribution of Life in North America* (1892); *Flora and Fauna of the Death Valley Expedition* (1893); *Temperature Control of Distribution of Animals and Plants* (1894); *Indian Population of California* (1905); *Totemism in California* (1908); *The Dawn of the World* (1910).

MERRIAM, FLORENCE. The maiden name of FLORENCE MERRIAM BAILEY (q.v.).

MERRIAM, HENRY CLAY (1837–1912). An American soldier, born at Houlton, Me. He graduated at Colby College, studied law, served in the Civil War in 1862 as captain in the Twentieth Maine Volunteer Infantry, resigned in 1863, and in the same year was appointed captain in the Eightieth United States colored troops. He served with colored troops from 1863 until the close of the war, was brevetted colonel of volunteers for faithful and meritorious services during the campaign against Mobile and its defenses, and in 1865 led the final attack on Fort Blakely, Ala., with the Seventy-third United States colored infantry. For this he was awarded the Congressional Medal of Honor (1894). In 1866 he became major in the Thirty-eighth Infantry of the regular army, in 1885 colonel of the Seventh Infantry, and in 1897 brigadier general. As commander of the departments of Columbia and California in 1898 he organized and forwarded troops for the Philippines expedition. In the same year Merriam was promoted major general of volunteers. He became commander of the Department of Colorado in 1900, was retired in 1901, and in 1903 was promoted major general (retired) of the regular army. The Merriam infantry pack was invented by him.

MERRIAM, JOHN CAMPBELL (1869–). An American paleontologist. He was born at Hopkinton, Iowa, and was educated (B.S., 1887) at the University of California, to which, after studying at Munich (Ph.D., 1893), he returned to be instructor in paleontology and historical geology (1894–99), assistant professor (1899–1905), associate professor (1905–12), and professor after 1912. His papers, which deal mainly with fossil reptiles and mammals of western North America and with the historical geology of the Pacific coast region, appeared for the most part in the University of California publications.

MER'RICK, FREDERICK (1810–94). An American educator, born at Wilbraham, Mass. He was educated at the Wesleyan Academy in his native town and at Wesleyan University. In his senior year he left college and became the principal of Amenia (N. Y.) Seminary, and from 1838 to 1843 he was professor of natural science in Ohio University at Athens, Ohio. Thereafter until his death 51 years later he was connected with Ohio Wesleyan University. He served the institution two years as financial agent, 15 years as professor, 13 years as president, and 21 years as emeritus professor and lecturer on natural and revealed religion. He was an Abolitionist and a contributor to the Underground Railway. Though never in charge of a parish, he was an ordained minister of the Methodist Episcopal church and a member of the Ohio conference, which he joined in 1841. He was a member of the General Conferences of 1860, 1864, and 1876. His entire property was bequeathed to Ohio Wesleyan University for the endowment of the Merrick lectureship. He was the author of *Formalism* (1865) and many fugitive poems and contributions to the religious press.

MER'RILL. A city and the county seat of Lincoln Co., Wis., 225 miles by rail northwest of Milwaukee, at the junction of the Wisconsin and Prairie rivers, and on the Chicago, Milwaukee, and St. Paul Railroad (Map: Wisconsin, D 3). It has broad and well-paved streets and contains the T. B. Scott Public Library, occupying a fine building, three parks, a well-equipped high school, and handsome courthouse and city hall buildings. The surrounding country possesses valuable hardwood timber, and there are important manufactories, producing sawed lumber, shingles, laths, sashes, doors and blinds, brooms, pails, hubs, shoes, knit goods, veneer, excelsior products, and pulp and paper. There are also some dairying interests. Excellent

water power is afforded by two large dams on the Wisconsin River. Settled in 1875, Merrill was incorporated five years later, being known as the village of Jenny until 1881, when it received its present name. The government is vested in a mayor, biennially elected, and a unicameral council. Pop., 1900, 8537; 1910, 8689; 1914 (U. S. est.), 8752.

MERRILL, Elmer Truesdell (1860–). An American Latin scholar, born at Millville, Mass. He graduated from Wesleyan in 1881 and pursued graduate studies at Yale, Berlin, Rome, and in England. He taught the classics at the Massachusetts State Normal School, Westfield (1882–83), and at Wesleyan (1883–86); after one year (1887–88) at the University of Southern California as professor of Latin, he returned to Wesleyan as professor of Latin language and literature (1888–1905); and for three years he held a similar chair at Trinity College, Hartford. In 1908 he became professor of Latin at the University of Chicago. He was active in the work of the American School of Classical Studies in Rome, of which he was professor (1898–99), acting chairman (1899–1900), and chairman (1900–01). After 1906 he was associate editor of *Classical Philology*, and in 1906–07 he served as president of the American Philological Association. Merrill was ordained a priest in the Protestant Episcopal church in 1895. In 1911 the University of St. Andrews gave him its LL.D. His publications include: *Poems of Catullus* (1893); *Fragments of Roman Satire* (1897); *Selected Letters of the Younger Pliny* (1903); *C. Plini Cæcili Secundi Epistularum Libri Novem* (1914). He contributed to the New International Encyclopædia.

MERRILL, Frederick James Hamilton (1861–1916). An American geologist, born in New York City. He graduated at the Columbia School of Mines in 1885, received his Ph.D. there five years afterward, held a fellowship in geology at Columbia College (1886–90), and was assistant in the New Jersey Geological Survey (1885–89). From 1890 to 1893 he was assistant geologist for New York State. He was assistant director (1890–94) and director (1894–1904) of the New York State Museum, and was in charge of the New York exhibit at the Columbian Exposition in Chicago in 1893, at the Buffalo Exposition in 1901, and at the St. Louis Exposition in 1904. He afterward established himself in Los Angeles as a consulting mining geologist. To the bulletin of the New York State Museum he contributed *Salt and Gypsum Industries in New York* (1893); *Mineral Resources of New York* (1896); *Road Materials and Road Building in New York* (1897); *Natural History Museums of the United States and Canada* (1903).

MERRILL, George Edmands (1846–1908). An American Baptist clergyman and educator, born at Charlestown, Mass. After graduating at Harvard University in 1869 and at Newton Theological Institution in 1872, he was pastor of Baptist churches in Massachusetts at Springfield (1872–77), Salem (1877–85), and Newton (1890–99). Two years (1885–87) he spent at Colorado Springs. From 1899 until his death he was president of Colgate University. His writings include: *The Story of the Manuscripts* (3d ed., 1881); *Crusaders and Captives* (1890); *The Reasonable Christ* (1893); *The Parchments of the Faith* (1895); "The Songs of Solomon," in the *American Commentary on the Old Testament* (1905). Merrill received the degree of D.D. from Colby College in 1895 and that of LL.D. from the University of Rochester in 1901.

MERRILL, George Perkins (1854–). An American geologist, born at Auburn, Me. He was educated at the University of Maine (B.S., 1879; Ph.D., 1889), was assistant in chemistry at Wesleyan University, Connecticut (1879–80), and studied at Johns Hopkins (1886–87). In 1881 he became assistant curator at the National Museum, Washington. He also served as professor of geology and mineralogy at the Corcoran Scientific School of Columbian (now George Washington) University after 1893, and was appointed head curator of the department of geology at the National Museum in 1897. His chief publications are: *Stones for Building and Decoration* (1891; 3d ed., 1903); *A Treatise on Rocks, Rock-Weathering, and Soils* (1897; 2d ed., 1906); *The Non-Metallic Minerals* (1904; 2d ed., 1910); *The Fossil Forests of Arizona* (1911); and many periodical contributions, especially on meteorites.

MERRILL, Lewis (1834–96). An American soldier, born at New Berlin, Pa. He studied at Lewisburg University, Pennsylvania, graduated at West Point in 1855, was assigned to duty as lieutenant with the First Dragoons, and served in Missouri, in Kansas Territory, and with the Utah expedition. In 1861, as colonel and first cavalry officer on the staff of John C. Frémont, he organized Merrill's Horse to oppose guerrillas in Missouri, and later commanded the Department of St. Louis and then that of Northern Missouri. In 1864 he was commander of the cavalry bureau at St. Louis and took part in the engagements at Franklin, Mo. The next year he was sent against guerrillas in northern Georgia and Alabama and was brevetted brigadier general. After various Western assignments he was placed in command of a military district in South Carolina with orders to break up the Ku-Klux Klan (q.v.). From 1871 to 1873 he succeeded in this so well that he received the thanks of the War Department. When similar conditions arose in the Red River district of Louisiana he was made commander there in 1875, remaining until the following year. As a consequence of his activities his nomination as lieutenant colonel in the regular army was held up for several years in the Senate by Southern sympathizers, but it was finally confirmed as from 1886. Merrill was retired in 1891.

MERRILL, Selah (1837–1909). An American Congregationalist clergyman and United States Consul, born at Canton Centre, Conn. After studying at Yale and at the New Haven Theological Seminary, he was ordained in 1864. During the last year of the Civil War he was chaplain of the Forty-ninth United States colored infantry and in 1868 went to Germany, where he studied two years. In 1874–77 he was in Palestine as archæologist of the American Palestine Exploration Society and was United States Consul at Jerusalem in 1882–85, 1891–93, and 1898–1907. While there he made important explorations and excavations to discover the second wall of Jerusalem and determine the site of Calvary. He taught at Andover Theological Seminary in 1872 and 1879 and became curator of the Biblical Museum there. In 1907 he became American Consul at Georgetown, Guiana. His works include: *East of the Jordan* (1881; 2d ed., 1883); *Galilee in the Time of Christ* (1881); *Greek Inscriptions Collected in the*

Years 1875–77 in the Country East of the Jordan (1885); *The Site of Calvary* (1885); *Ancient Jerusalem* (1906).

MERRILL, Stephen Mason (1825–1905). An American Methodist Episcopal bishop, born in Jefferson Co., Ohio. He entered the ministry of his church, joining the Ohio conference in 1846, was editor of the *Western Christian Advocate* (1868–72), and in 1872 was elected Bishop. He retired in 1904. He was a member of the General Conference of 1868 and 1872 and of the Ecumenical Methodist Conference of 1891. His chief works are: *Christian Baptism* (1876); *New Testament Idea of Hell* (1878); *Second Coming of Christ* (1879); *Aspects of Christian Experience* (1882); *A Digest of Methodist Law* (1885; rev. ed., 1913); *Organic Union of American Methodism* (1892); *Mary of Nazareth and her Family* (1895); *The Crisis of this World* (1896); *Atonement* (1901); *Sanctification* (1901); *Miracles* (1902).

MERRILL, Stuart (1863–1915). An American poet of French residence, born at Hempstead, Long Island. He went to Paris as a child and studied at the Lycée Condorcet, studied law at Columbia University from 1885 to 1889, and in 1890 returned definitely to France. He wrote a number of articles for the New York *Times* and the *Evening Post* on contemporaneous French writers. His verse shows a fastidious delicacy of phraseology but possesses an almost magic power. He wrote: *Les gammes* (1887); *Pastels in Prose* (1890), translations from Banville, Baudelaire, etc.; *Les fastes* (1891); *Petits poèmes, d'automne* (1895); *Poèmes, 1887–1897* (1897); *Les quatre saisons* (1900). After 1900 his work appeared in literary reviews.

MERRILL, William Emery (1837–91). An American soldier and military engineer. He was born at Fort Howard, Wis.; graduated first in his class at West Point in 1859, and from September, 1860, to July, 1861, was assistant professor of engineering there. In the Civil War he served as assistant engineer in the Army of the Potomac during the Peninsular campaign and in the northern Virginia campaign, and from July, 1864, to September, 1865, commanded, as colonel, a regiment of veteran volunteer engineers. During the war he received the successive brevets of captain, major, lieutenant colonel, and colonel for gallant services. In March, 1867, he was raised to the regular rank of major and in February, 1883, to that of lieutenant colonel. From 1867 to 1870 he was chief engineer on the staff of General Sherman, then commanding the Military Division of the Missouri, and thereafter until his death he was engaged on engineering work for the government. One of the most notable engineering works of its kind in America was the Chauvine wicket movable dam constructed by him at Davis's Island, 5½ miles below Pittsburgh. In 1889 he represented the United States Engineer Corps at the International Congress of Engineers at Paris. He published *Iron Truss Bridges for Railroads* (1870) and *Improvement of Non-Tidal Rivers* (1881).

MER'RIMAC, The. 1. A United States frigate, sunk with other vessels when the Federal government abandoned the Norfolk Navy Yard in 1861, and reconstructed as a Confederate ironclad. She was then renamed the *Virginia*. After destroying the *Congress* and the *Cumberland* at Newport News on March 8, 1862, she met the *Monitor* in Hampton Roads on March 9 and after a contest of four hours was obliged to withdraw. She was destroyed when the Norfolk yard was evacuated by the Confederates on May 11, 1862. See Hampton Roads; Monitor.

2. A collier accompanying the United States fleet investing Santiago de Cuba in 1898. In an effort to prevent the escape of the Spanish fleet she was sunk at the mouth of the harbor on June 3 by Lieut. Richmond P. Hobson, who, after accomplishing his perilous feat, was captured by the Spaniards and held prisoner until July 6.

MERRIMAC RIVER. A river of New Hampshire and Massachusetts. It is formed near Franklin by the union of the Winnepesaukee and Pemigewasset, the former being the short outlet of the lake of that name and the latter the outlet of Profile Lake, in Franconia, N. H., 50 miles north of Franklin and less than 10 miles from Mount Washington (Map: Massachusetts, E 2). From Franklin the river flows southward for about 60 miles, until it enters Massachusetts, when it turns eastward for about 40 miles and empties into the Atlantic Ocean at Newburyport. Its drainage area is about 5015 square miles, and its chief importance is the water power which it furnishes to the manufacturing cities of Lowell, Lawrence, and Manchester.

MER'RIMAN, Henry Seton. The pseudonym of the English novelist Hugh S. Scott (q.v.).

MERRIMAN, John Xavier (1841–). A South African statesman. He was born at Street, Somersetshire, the son of N. J. Merriman (1810–82), who was Bishop of Grahamstown. He first went to South Africa in 1849 and again, after studying in England, in 1861; and in 1869 entered politics in Cape Colony. He was Commissioner of Crownlands in 1875–78 (Molteno ministry) and 1881–84 (Scanlen ministry) and Treasurer General in 1890–93 (Rhodes ministry) and in 1898–1900 (Schreiner ministry). In 1896 he was a member of the committee on the Jameson Raid and drew up its report. He opposed Kruger's narrow policy in 1898. With J. W. Sauer in the summer of 1901 he represented the Cape Afrikanders in a mission to London which sought to continue the independent republics. In 1908, upon the victory of the Bond party, he succeeded Jameson as Premier of Cape Colony and for two difficult years held this post and that of Treasurer. He was a prominent member of the National Convention for Union in 1908–09; and in 1910 opposed the formation of a coalition cabinet for the Union and refused to serve in a cabinet under Botha.

MERRIMAN, Mansfield (1848–). An American civil engineer, born at Southington, Conn. He graduated at Sheffield Scientific School (Yale) in 1871, was assistant in the United States Corps of Engineers in 1872–73, and instructor in civil engineering at Sheffield from 1875 to 1878. He was professor of civil engineering in Lehigh University from 1878 to 1907 and thereafter a consulting civil and hydraulic engineer. From 1880 to 1885 he was also assistant on the United States Coast and Geodetic Survey. His researches in connection with hydraulics, bridges, strength of materials, and pure mathematics are important. His chief publications, widely used as standard textbooks, are: *Method of Least Squares* (1884; 8th ed., 1901); *Mechanics of Materials* (1885; 10th ed., 1910); with Jacoby, *A Text-Book on Roofs and*

Bridges (4 vols., 1888–98; 5th ed., 1912); *Treatise on Hydraulics* (1889; 9th ed., 1914); *Handbook for Surveyors* (1895; 3d ed., 1903); *Strength of Materials* (1897; 6th ed., 1913); *Precise Surveying and Geodesy* (1899); *Elements of Sanitary Engineering* (1898; 3d ed., 1906); *Elements of Hydraulics* (1912). In addition, he was editor in chief of the *American Civil Engineers' Pocket Book* (1911).

MER'RITT, Ernest George (1865–). An American physicist. He was born at Indianapolis, Ind.; attended Purdue University in 1881–82; graduated M.E. from Cornell in 1886; and studied at Berlin in 1893–94. At Cornell he was instructor in physics in 1888–91, assistant professor from 1892 to 1903, professor after 1903, and dean of the Graduate School after 1909. He served as vice president of the American Physical Society and contributed to periodicals various papers on physics.

MERRITT, Wesley (1836–1910). An American soldier, prominent in the Civil War and the Spanish-American War. He was born in New York City. After graduating at West Point in 1860 he was assigned to a cavalry regiment (1861), acted as aid to General Cooke (1862), participated in Stoneman's famous raid towards Richmond (April–May, 1863), and commanded the reserve cavalry brigade of the Army of the Potomac in the battle of Gettysburg and in the Richmond campaign of April–August, 1864. In the Shenandoah Valley campaign under Sheridan and in the final Richmond campaign he commanded cavalry divisions. By the end of the war he was major general of volunteers and brevet major general in the regular army. Afterward he saw varied service, first in the Southwest, on frontier duty at various stations. In 1876, the year that he was promoted colonel of the Fifth Cavalry, he served in the Big Horn and Yellowstone Indian campaigns in Wyoming and Dakota. From 1882 to 1887 he was superintendent of the United States Military Academy. Merritt was promoted brigadier general (1887) and major general (1895). He was in command of the Department of the East in 1897–98; was placed in command of the United States forces in the Philippine Islands in May, 1898; and later in the same year was summoned to Paris to assist the American peace commissioners. Thereafter until his retirement in June, 1900, he commanded the Department of the East.

MERRITT, William Hamilton (1793–1862). A Canadian statesman. He was born in Westchester Co., N. Y., and in 1796 was taken to Upper Canada by his parents, who were United Empire Loyalists. (See Loyalists.) He was educated at Ancaster, Upper Canada, and at King's College, Windsor, Nova Scotia. During the War of 1812–15 he took part in the capture of Detroit and the battles of Queenston Heights, Stoney Creek, and Lundy's Lane. He projected the Welland Canal (q.v.) and the Welland Railway, and it was mainly through his efforts that both were constructed. In 1845 he also projected the Niagara Falls suspension bridge. Merritt was a Liberal member of the Upper Canada Legislative Assembly in 1832–41. He was President of the Council in the Lafontaine-Baldwin administration (1848) and in 1850 Commissioner of Public Works, and in 1860 he was elected a member of the Canada Legislative Council. His writings include: *A Concise View of the Inland Navigation of the Canadian Provinces* (1832); *A Brief Review of the Revenue, Resources, and Expenditure of Canada* (1845); *A Journal of Events Principally on the Detroit and Niagara Frontier during the War of 1812* (1863).

MERRITT, William Hamilton (1855–). A Canadian mining engineer and soldier, grandson of the preceding. He was born at St. Catherines, Ontario, and was educated at Upper Canada College, the Royal Military School, and the Royal School of Mines, London, England, where he graduated in 1877. He practiced his profession in Toronto. In 1878 he served in connection with the Canadian commission at the Paris Exposition, and was later appointed lecturer in mining engineering in the School of Mining, Kingston. He was a member of the Royal Commission to inquire into the mineral resources of Ontario and was elected vice president of the Ontario Mining Institute. Merritt was gazetted a cornet in the Governor-General's bodyguard in 1884, served in the Northwest rebellion (1885), in the Boer War (1899–1902), taking part in many actions, and was promoted lieutenant colonel in 1903. He contributed papers to the *Proceedings* of the Geological Society, London, England; *Proceedings* of the American Institute of Mining Engineers; and *Proceedings* of the Canadian Institute. He published *Economic Minerals of Ontario* (1896) and *Field Testing for Gold and Silver* (1900).

MER'RY, Robert (1755–98). An English poet, born in London. He studied at Christ College, Cambridge, and began the study of law, but was never called to the bar. Merry traveled extensively throughout Europe, and in Florence was made a member of the so-called Della Cruscan Circle. He wrote much for the Florence *Miscellany*, and after his return to England published reams of affected and grandiloquent verse over the signature Della Crusca. He also wrote a number of incoherent dramas, including: *Lorenzo* (1791); *The Magician No Conjurer* (1792); *The Abbey of St. Augustine* (1797). From 1796 he resided in the United States, where his wife, Elizabeth Brunton, was an acceptable actress for many years.

MERRY, William Walter (1835–). An English classical scholar, clergyman, and educator. He was born in Worcestershire and was educated at Cheltenham College and Balliol College, Oxford, where he gained the chancellor's prize for a Latin essay in 1858. He was select preacher to the university in 1878–79 and in 1889–90, and Whitehall preacher in 1883–84; public orator at Oxford from 1880 to 1910; a member of the Hebdomadal Council (1896–1908); and vice chancellor (1904–05). For many years he was engaged in the preparation of editions of the classical authors, published by the Clarendon Press, Oxford. Of these may be mentioned Homer's *Odyssey* (books i to xii, with James Riddell; 2d ed., 1886); a school edition of the same books and another of books xiii to xxiv—of the former 66,000 copies were sold, of the latter 16,000; a series of editions of the plays of Aristophanes, begun in 1879. (Some of these have gone through several editions.) Other works in classical literature are *The Greek Dialects* (1875) and *Selected Fragments of Roman Poetry* (2d ed., 1901).

MERRY DEL VAL, Raphael, Cardinal (1865–). A Roman Catholic prelate, born in London (where his father was secretary of

the Spanish legation) and educated partly in England, partly in Rome. In 1888 he took orders, in 1892 was made papal chamberlain, and in 1897 became prelate of the papal household. He represented the Vatican at the jubilee of Queen Victoria and the coronation of Edward VII, and was sent on a special mission to Canada; in 1900 was consecrated Bishop of Nicæa in partibus; was secretary of the conclave which in August, 1903, elected Pius X pope; and in October succeeded Cardinal Rampolla as papal Secretary of State. In the conduct of this important office he was criticized for adopting an aggressive policy which helped to intensify the strained relations between the Curia and the French government. In November, 1903, he was created Cardinal. In September, 1914, upon the accession of Pope Benedict XV, Merry del Val was succeeded as Secretary of State by Cardinal Ferrata (q.v.). Although probably the most widely known representative of the Catholic hierarchy, it was not expected that he could be elected Pope, because of the antagonism he had aroused. While Pius was Pope Merry del Val had sought persistently to acquire more power for himself. In October, 1914, he was appointed secretary of the congregation of the Holy Office. He wrote *The Truth of the Papal Claims* (1909).—His brother, Don Alfonso Merry del Val (born, 1864), after being long in the Spanish diplomatic service, was appointed Ambassador to Great Britain in 1913.

MERRY DEVIL OF EDMONTON, The. An anonymous comedy acted in 1607 and printed in 1608. It has been attributed on slight evidence to Drayton by Coxeter, and also ascribed to Shakespeare. Fleay thinks the play, originally called *Sir John Oldcastle*, was written by Drayton for the Chamberlain's Men before 1597, and that the prose story of the same title by T. B., 1608, is not to be identified with the play. It was very popular; Jonson remarks that it was the "dear delight of the public." Allusions to it are found in *Grim, the Collier of Croyden*, and probably in *Merry Wives of Windsor* as well.

MERRY ENGLAND. An old popular name of England, in which the word merry has its early meaning of pleasant.

MERRY MONARCH, The. A nickname of King Charles II of England.

MERRY MOUNT. The name of a settlement made by Thomas Morton within the limits of the present Quincy, Mass. See Morton, Thomas.

MERRY WIVES OF WINDSOR, The. A comedy by Shakespeare, produced probably in 1597, printed complete in 1623. An imperfect copy, entitled *Sir John Falstaff and the Merry Wives of Windsor*, was printed by Thomas Creede in 1602, bearing evident marks of haste. The play was made for a court performance and is said to have been written at Queen Elizabeth's command, to show Falstaff in love. Some incidents of the plot are taken from two tales in Straparola's *Notti Piacevoli;* from Tarleton's *The Lovers of Pisa* in his *Newes Out of Purgatorie;* from Brainford's "Fishwife's Tale" in *Westward for Smelts*. The buck basket found in the tale of Buciolo in Fiorentino's *Pecorone* is in the comedy the basket of soiled linen in which Falstaff hides. It is notably a play of middle-class people and, like *Much Ado about Nothing*, is mostly prose. A version called *The Comical Gallant* was made in 1702 by John Dennis, who is one authority for Elizabeth's connection with the play. Another is Rowe in 1709.

MERSCHEID, mĕr′shīt. A town of Germany. See Ohligs.

MERSEBURG, mĕr′ze-burk. A town in the Province of Saxony, Prussia, situated on the Saale, about 20 miles west-northwest of Leipzig (Map: Germany, D 3). It consists of the city proper, the free ground of the cathedral, the new quarters, and the suburbs of Altenburg and Neumarkt. Its fine cathedral, begun in the eleventh and finished in the sixteenth century, contains the grave of Rudolf of Swabia, a fine chancel and organ. The Gothic castle, the former residence of the bishops, is now used as an administration building. There are also the Rathaus, the assembly house, and the chapter house. The Gymnasium, founded in 1575, is the chief educational institution. Merseburg manufactures machinery, leather, iron products, toys, textiles, motors, cellulose, cigars, dyes, and beer. It is considered one of the oldest towns of Germany. As early as the ninth century it was the residence of the counts of Merseburg. During the tenth, eleventh, and twelfth centuries it was the favorite residence of the German emperors and the seat of a bishop and many diets. Merseburg was the seat of an important bishopric in the Middle Ages. With the introduction of Protestantism the see passed to Saxony. Its fairs were also of great importance. Near Merseburg the German King, Henry the Fowler, won a great victory over the Hungarians in 933. Pop., 1900, 19,119; 1910, 21,226, chiefly Protestants.

MERSENNE, mâr′sĕn′, Marin (1588–1648). A French theologian and scholar, born at La Soultière (Maine). He studied at the college of La Flèche, where he had as a fellow pupil René Descartes, with whom he always maintained a close friendship. In 1611 he became a Minim friar. Afterward he taught philosophy at Nevers from 1614 to 1620, and subsequently lived principally in Paris. He was the Parisian representative of Descartes while the latter was in Holland. Later his studies grew more scientific and he published a number of treatises on astronomy and mathematics. He also wrote *Harmonie universelle, contenant la théorie et la pratique de la musique* (1636), and a Latin epitome of it, *Harmonicorum Libri XII* (1636). From these we learn much of the condition of music in the seventeenth century and his own discoveries in the phenomena of vibration.

MERSEY, mĕr′zĭ. A river of England, separating the counties of Chester and Lancaster (Map: England, D 3). It enters the Irish Sea by a wide estuary forming the Liverpool channel. This channel is deep and navigable for several miles above Liverpool. By means of a ship canal, which follows for some distance the course of the river and crosses it several times, navigation can be continued to Manchester and beyond. See Liverpool.

MERSHON, mĕr′shon, Ralph Davenport (1868–). An American electrical engineer and inventor, born at Zanesville, Ohio. He graduated M.E. from Ohio State University in 1890; was employed by the Westinghouse Electric and Manufacturing Company from 1891 to 1900; and thereafter was in practice as a consulting engineer. He installed the electric plant of the Colorado Electric Power Company at Cripple

Creek; reconstructed the transmitting and receiving apparatus of the Montreal and St. Lawrence Light and Power Company, and designed the plants of the Shawinigan Water and Power Company of Montreal and the Niagara, Lockport, and Ontario Power Company. In 1905 he was consulting engineer of the Victoria Falls Power Company (South Africa). He invented a six-phase rotary converter, a compounded rotary converter, and a system of lightning protection for electric apparatus for which he received the John Scott Legacy medal of the Franklin Institute. In 1912–13 he was president of the American Institute of Electrical Engineers.

MERSINA, mĕr′sē-nä′. A seaport town in the Vilayet of Adana, Asia Minor, situated on the south coast, 41½ miles by rail west-southwest of Adana (Map: Turkey in Asia, C 3). It is well built and surrounded by fine gardens. The harbor, an open roadstead, is not very deep, and steamers usually anchor a long distance from the town. It is the busiest port on the south coast of Asia Minor, being the outlet for a rich agricultural district. The United States is represented by a consular agent and it is the seat of an American mission. Mersina is of recent origin; its population is estimated at over 15,000, about one-half Christian, of whom the Armenians and the Greeks are in the majority.

MERSON, mâr′sôn′, Luc Olivier (1846–1920). A French decorative and historical painter, born in Paris. He studied under Chassevent and Pils, was awarded the Prix de Rome in 1869, and obtained a gold medal at the Paris Exposition of 1889. His pictures, treating historical and religious subjects, are painted with peculiar, poetic charm, and his drawings have the same delicate, almost tender, quality. His most notable mural paintings are two episodes from the life of St. Louis, in the Palais de Justice, Paris, and decorations by him are in the Opéra Comique, the Hôtel de Ville, the Sorbonne, and the church of St. Thomas d'Aquin. Among his other paintings are "St. Isidore" and "The Annunciation" (1903). He illustrated Victor Hugo's *Notre Dame de Paris* and works by Gautier, Flaubert, and others

MERTHYR TYDFIL, mĕr′thĕr tĭd′vĭl. A municipal, parliamentary, and county borough in Glamorganshire, south Wales, surrounded by lofty hills and built on the river Taff, about 500 feet above sea level, 22 miles northwest of Cardiff (Map: England, C 5). Merthyr Tydfil is the seat of the iron trade of south Wales, and contains large collieries, celebrated for the excellence of steam coal. The Dowlais Ironworks have 18 blast furnaces, and Cyfartha works produce steel. The town has greatly improved since 1850; it has modern churches, a town hall, public baths, a library, a good water supply, and two profitable sewage farms. It maintains two infectious-disease hospitals. Pop., 1901, 69,228; 1911, 80,990.

MERTON, mĕr′ton, Walter de (?–1277). An English prelate, founder of Merton College, Oxford. He was educated in the priory at Merton, Surrey, and was ordained to the priesthood. Henry III raised him in 1261 to the lord-chancellorship, from which office he was deposed in 1263 by the barons under Simon de Montfort. He returned to that office in 1272, but in 1274 resigned to accept an appointment to the see of Rochester. He founded at Basingstoke a hospital for superannuated clergymen and travelers in distress, but is best known as the founder of Merton College (q.v.), Oxford, which was completed in 1274. This was originally designed, it would appear, for the education of the secular clergy and offered courses in philosophy, the liberal arts, and theology—*in arte, dialectica, et theologia*, as the Rochester chronicles express it. It became the model of subsequent foundations at both Oxford and Cambridge, and was thus the basis of the collegiate system peculiar to these two English universities.

MERTON COLLEGE. The oldest college of its type in Oxford and the model of all later secular colleges in both Oxford and Cambridge. It was first founded as the House of the Scholars of Merton, in 1263 or 1264, by Walter de Merton (q.v.). The original endowment consisted of his manor house and estate at Malden, Surrey, the income from which was to go to the support of scholars in Oxford, the estate being managed by a resident warden and "brethren." By various changes between 1264 and 1274 the scholars were moved from a rented house to their own property, Merton Hall, acquired for them by the founder, and were put in charge first of a subwarden, then of the warden himself, who had come up from Surrey. The number of scholars, who had been originally confined to the members of the founder's family, was increased, and the collegiate idea of the foundation was crystallized in the Statutes of 1274. The addition of a system of ecclesiastical patronage, the arrangement of the buildings, and the plan, size, and beauty of the chapel, in addition to the scheme of the statutes, had great influence on later foundations. The college has suffered various changes since its establishment, the last of which was its absorption of St. Alban Hall in 1882. There were, in 1911–12, a warden, 19 fellows, 2 honorary fellows, 34 scholars and exhibitioners, 4 lecturers, 2 chaplains, college officers, and, in all, some 150 undergraduates. The buildings are among the most interesting in Oxford, being partly of the thirteenth century. Here Henrietta Maria occupied the warden's apartments, while Charles I's court was held at Oxford. Again, in 1665, the year of the plague, Charles II moved his court hither, and his Queen occupied the lodgings formerly used by Henrietta Maria. The chapel, though not completed, is of cathedral size, but has no transepts. Among the worthies of Merton may be mentioned Harvey, the demonstrator of the circulation of the blood, Bishops Patterson and Jewell, Anthony Wood, Sir Thomas Bodley, Sir Richard Steele, and Sir H. Savile. Consult Hastings Rashdall, *Universities of Europe in the Middle Ages*, vol. ii, part ii (Oxford, 1895), and Henderson, "Merton College," in *University of Oxford College Histories* (London, 1902). See Merton, Walter de; Oxford University.

MERU, mā′rōō. A fabulous mountain in Hindu mythology, the abode of the gods. It is supposed to stand at the centre of the world, and it towers to a height of 80,000 leagues; the sun, moon, and stars revolve about its summit. Regarded as a terrestrial mountain, it would seem to have been located somewhere to the north of the Himalayas.

MERULO, mĕr′ōō-lō, Claudio (1533–1604). An Italian organist and composer, born at Correggio. His real name was Merlotti. A pupil of Girolamo Donati, he began his career as organist at Brescia. In 1557 he came to Venice as second

organist at San Marco. He succeeded to the position of first organist in 1566, and this important post he held for 20 years, when the Duke of Parma offered him the post of court organist. He died at Parma. Not only was he one of the greatest masters of his instrument, but his compositions for organ are of permanent value, being among the earliest specimens of a distinct organ style, which a little later became a most important factor in the development of instrumental music. His vocal compositions consist of several books of madrigals, motets, and masses; his works for organ comprise three books of *Ricercari*, three of *Canzoni*, and two of *Toccate*. Consult G. Gasperini, *Claudio Merulo da Correggio* (Parma, 1904).

MERV, mĕrf. A region in Central Asia now forming a district in the Russian Transcaspian Province, a short distance from the northeast corner of Persia (Map: Asia, Central, J 4). Its area is estimated at about 49,000 square miles. The northern and larger part is a vast sandy plain with very little vegetation. The southern part is more elevated and watered by the Murghab and its tributaries. The summers are long and hot, and the annual average temperature is from about 57° F. to 60° F., ranging from —6° F. to 113° F. The precipitation is very meagre, especially in the northern part. The chief occupation of the inhabitants is agriculture, which is made possible only by irrigation. Unirrigated regions are utilized to some extent for stock raising by the nomadic tribes. The chief centre of agriculture is the oasis of Merv, to which the name was formerly confined. The area of the oasis is about 2000 square miles, and it contains a large share of the population of the district, though there is a considerable nomadic population outside the oasis. The water for irrigation is supplied by the Murghab and a few of its tributaries. Wheat, rye, millet, and barley are the chief cereals raised in the irrigated portions of the territory. The oasis is renowned throughout the East for its fertility. The carpets are regarded as superior to the Persian, and the manufactures of silver hold high rank. Transportation is effected principally by the use of pack animals, although the territory is crossed by the Transcaspian Railway line. Near the railway line are the Imperial estates of Murghab, with extensive irrigation works. The population of the district is variously estimated from 120,000 to 240,000; that of the oasis is about 120,000 and is composed, with the exception of a few Russian Jews and Persians, of Tekke Turkomans, divided into a number of clans. They all profess Islam.

The capital of the district, known as New Merv, is situated on the Murghab and the Transcaspian Railway. It has a number of schools, churches, a meteorological observatory, and some trade. The population is about 12,000, consisting of Russians, Turkomans, Armenians, Persians, and Jews. About 25 miles east of New Merv are the ruins of three cities, of which one, existing in the time of Strabo, was, according to that historian, of great extent and importance.

Merv is a very ancient settlement, its name (Mouru) being mentioned in the Zend-Avesta. In old traditions it is looked upon as the cradle of the human race. It once formed a satrapy of the Persian Empire. An archbishopric of the Nestorian church existed there as early as the fifth century. Occupied by the Arabs in the seventh century, the city of Merv became the capital of Khorasan and a great intellectual centre, rising to still greater importance in the eleventh century while under the rule of the Seljuks. The prosperity of Merv came to an end with the invasion of the Turkomans about the middle of the eleventh century. The district was almost entirely depopulated by the Monguls under Tulai in 1221. At the end of the fourteenth century it fell into the hands of Timur, and after a short occupation by the Uzbeks at the beginning of the sixteenth century was taken by the Persians, under whose rule it remained until 1787, when it was occupied and later entirely devastated by the Bokharians. About the middle of the nineteenth century it was invaded by the Tekke Turkomans, who became the ruling race (1556). In 1884 Merv was annexed by Russia. In 1898 a strategical railroad from Merv to the frontier of Afghanistan was opened up.

MERWARA. See AJMERE-MERWARA.

MERX, mĕrks, ADALBERT (1838–1909). A German theologian and Orientalist. He was born at Bleicherode, near Nordhausen, and studied at Jena, Marburg, Halle, and Berlin. From 1865 to 1875 he was professor of Semitic philology and theology at Jena, Tübingen, and Giessen. In the latter year he took the chair of theology at Heidelberg. He belongs to the school of liberal theologians, who fully acknowledge the right of unrestricted criticism of the Scriptures. Among his published works are: *Das Gedicht von Hiob* (1871); *Die saadjanische Uebersetzung des Hohenliedes ins Arabische* (1883); "Historia Artis Grammaticæ apud Syros," in *Abhandlungen für Kunde des Morgenlandes* (Leipzig, 1889); *Idee und Grundlinien einer allgemeinen Geschichte der Mystik* (1893); *Die vier kanonischen Evangelien nach ihrem ältesten bekannten Texte* (1897–1905).

MÉRY, mā'rē', JOSEPH (1798–1866). A French satirical poet, born Jan. 21, 1798, in Aygalades (Bouches-du-Rhône). In 1824 he went to Paris, where he aroused attention through a political satire, *La Villélaide, les Jésuites* (1826), by some Bonapartist poems, and by work on a satirical journal *Némésis*. Later he wrote dramas, romances, and novels remarkable for their exotic descriptions of lands Méry had never seen. Of his once very popular stories, *Héva* (1843) and *Nouvelles nouvelles* (1853) are sufficiently typical. Méry died in Paris, June 17, 1866. Consult Claudin, *Méry, sa vie intime* (Paris, 1866).

MERYON, mār'yōn', CHARLES (1821–68). A French etcher, born in Paris. He was educated at the Naval School in Brest and afterward rose to the position of lieutenant in the navy. Failing health caused him to resign, and he took up etching, which he studied at Paris, achieving the highest success in this art. Though strong and precise, his execution is of rare delicacy and his art is highly imaginative. His fame is posthumous; he lived in poverty and discouragement and died in an insane asylum at Charenton. Of his etchings the best known are the series of 23 plates, *Eaux-fortes sur Paris* (1850–54), which fairly evoke the spirit of old Paris, then rapidly disappearing under the improvements of Haussmann. Consult: Wedmore, *Meryon and Meryon's Paris* (London, 1879); Burty, *L'Œuvre de Charles Meryon*, translated by Huish (ib., 1879); Bouvenne, *Notes et Souvenirs sur Charles Meryon* (Paris, 1883); Loys

Delteil, *Peintre-Graveur illustré*, vol. ii (ib., 1907).

MERZ, John Theodore (1840–1922). An English writer on philosophy, born in Manchester and educated in Germany—at Darmstadt, Giessen, Göttingen, Heidelberg, and Bonn. He lived in Newcastle-upon-Tyne, where he was director in chemical and electrical corporations and a member of the Armstrong College of Durham University. Merz received honorary degrees from Durham and Aberdeen for his book on Leibnitz (1884), in the "Philosophical Classics," and for his remarkable work entitled *A History of European Thought in the Nineteenth Century* (4 vols., 1896–1914; vol. i, 3d ed., 1907; vol. ii, 2d ed., 1912).

MERZIVAN. See Marsivan.

MESA, mā'sȧ. A Spanish word meaning "table" (cf. Latin *mensa*) and used especially in the southwestern United States to designate the small, isolated remnants of plateaus, usually rising abruptly from the surrounding plains, which are found scattered over the region traversed by the Colorado River (Map: Colorado, A 2). The mesas result from the dissection of a plateau, having horizontal strata, but with the upper layer of more resistant rock than the underlying. In many cases the capping stratum represents portions of an ancient lava flow which has been poured over the sedimentary rocks. In the process of denudation the underlying weaker strata crumble under the weathering process, the overlying resistant stratum is thus gradually undermined, and fragments of the latter fall down. Thus the face of the mesa is generally steep, called an escarpment face, and this is maintained during all the time of the process of denudation. The name "mesa" is generally applied to remnants of plateaus of considerable top area, and smaller areas of similar form are called buttes. The Enchanted Mesa and the Mesa Verde are frequently used as types.

The Enchanted Mesa, called by the Indians Katzimo, is situated near the village of Acoma in west central New Mexico. It is a perpendicular sandstone rock rising from a grassy plain. It is of elongated shape, 2050 feet long, and from 100 to 350 feet wide. Above a sloping talus, 100 to 200 feet in height, towers the perpendicular wall to a height of 430 feet above the plain. The summit is nearly level and consists of a hard rock very much weathered and supporting a few stunted cedars. The rock is held in superstitious awe by the neighboring Acoma Indians, and a tradition is current among them that their remote ancestors once inhabited the summit. This mesa has been described by F. W. Hodge in "The Enchanted Mesa," in *National Geographical Magazine*, vol. viii (1897), pp. 273–284, and here he writes of the evidences of a former occupation.

The Mesa Verde is situated in the extreme southwestern corner of Colorado, on the right bank of the Mancos River. It is a plateau 15 miles long and 8 miles wide. Its talus is 300 to 500 feet high, above which rises a precipitous wall of yellow sandstone 150 to 300 feet farther, the top of the mesa being 400 to 800 feet above the plain. The area has enough rainfall to support a covering of grass and a scattering of scrubby cedars and piñons, and from this the mesa derives its name (*Verde* = green). The summit is more accessible than that of the Enchanted Mesa, being intersected by the numerous ramifications of a cañon which opens into that of the Mancos River. The rock walls of the Mesa Verde are interrupted by numerous horizontal ledges occupied by the ruins of ancient cliff dwellings, some in a remarkable state of preservation. Large numbers of stone implements, potsherds, and some mummies have been found among the ruins. Consult Atwood, "A Geographic Study of Mesa Verde," in *Annals of the Association of American Geographers*, vol. i (1911), p. 95. See Cliff Dweller.

MESA. A town in Maricopa Co., Ariz., 18 miles by rail southeast of Phœnix, on the Arizona Eastern Railroad (Map: Arizona, D 4). Among the interesting features of the town are the public library, the Toltec ruins, government experimental farm, Granite Reef Dam, government power plant, and the splendid public-school buildings. Mesa is in a rich agricultural, fruit-growing, and stock-raising region. It has ample water power, derived mainly from the Roosevelt Dam (q.v.). The town was settled in 1879 by a colony of Mormons from Salt Lake City and other places in Utah, but is now composed mostly of non-Mormons. The water works are owned by the municipality. Pop., 1900, 722; 1910, 1692.

MESAGNE, mȧ-sä'nyȧ. A town in the Province of Lecce, south Italy, about 10 miles by rail southwest of Brindisi. It is an ancient town, picturesquely situated in a fertile region, producing oil, wine, grain, and fruit. Pop. (commune), 1901, 12,105; 1911, 13,740.

MESARCH, mĕs'ärk. A term used in the vascular anatomy of plants. In the development of a xylem (wood) strand the first elements to appear are spiral vessels, and this first group of elements is called the protoxylem. If the later xylem elements (metaxylem) develop in every direction from the protoxylem, so that it becomes surrounded by metaxylem, the xylem strand is said to be mesarch. The coördinate terms are exarch and endarch, the former indicating that the metaxylem is developed centripetally from the protoxylem, and the latter that it is developed centrifugally. The result is that in an exarch strand the protoxylem is upon its outer edge; in an endarch strand the protoxylem is upon its inner edge (next to the pith); while in a mesarch strand the protoxylem is embedded in metaxylem. Exarch strands are the most primitive, occurring in all roots and in the stems of the more primitive pteridophytes (as club mosses); mesarch strands are characteristic of the ferns; while seed plants have endarch strands.

MESA VERDE. See Mesa.

MESCAL. See Agave.

MESCALA, mȧs-kä'lȧ, or **MEXCALA.** A river of Mexico, rising in the State of Tlaxcala, 60 miles east of Mexico City. It flows in a general westerly direction for 430 miles and empties into the Pacific near Zacatula. It is known in its upper course as the Atoyac, and in the lower, where it serves as the boundary line between the states of Guerrero and Michoacán, as the Río de la Balsas. The current is exceedingly swift, and the river is navigable for only a short distance, but it furnishes power to a number of textile and other mills.

MESCALERO, mȧ'skȧ-lā'rō. A small Athapascan tribe. They receive their name from their use of mescal bread prepared from the maguey root by roasting under cover until it softens into a white, sticky, and sweetish mass, which is said to be extremely nutritious. They

formerly ranged over the arid Pecos and Staked Plain region of Texas and New Mexico, and were constantly at war with the Ute and Navaho, while maintaining a precarious friendship with the Kiowa and Comanche. They lived entirely by hunting and depredation upon the frontier settlements of Texas and Mexico, in company with other roving tribes, and were distinguished for their warlike and cruel disposition. Their shelters were mere wikiups of boughs; they planted nothing and went nearly naked. Since about 1865 they have been confined upon a reservation in southeastern New Mexico. In 1855 they were estimated at about 750. They number now 424. Consult P. E. Goddard, *Indians of the Southwest* (New York, 1913).

MESDAG, mĕs'däg, HENDRIK WILLEM (1831–1915). An eminent Dutch marine painter. He was born in Groningen, the son of a banker, and until the age of 35 he followed his father's vocation. Encouraged by his wife, he then studied painting under Roelofs and Alma-Tadema in Brussels, and afterward lived at The Hague. He is one of the best of Dutch marine painters. His style is realistic and simple, and his work is characterized by breadth of treatment, fine atmospheric effects, sober color, and harmony of feeling. He is preëminently the painter of the North Sea. His services to modern Dutch painting are incalculable. Possessed of considerable wealth, he was a liberal patron of his less fortunate fellows and devoted his time and money to the organization of exhibitions and every other means of promoting Dutch art. His works include: "Return of the Fishing Boats" (1875), in The Hague Museum; "The Shore at Scheveningen," "A Calm Sea," and six other paintings, including two portraits, in the Rijks-Museum; "Summer Evening near Scheveningen," in the Berlin Gallery; "After the Storm," in the Brussels Gallery. He also painted an interesting panorama of Scheveningen, which, together with a collection of his own and his wife's work, forms a permanent exhibition at The Hague. In 1902 he presented to The Hague his admirable collection of paintings, including excellent specimens of the Barbizon school and modern Dutch painting, bronzes, porcelains, and rugs, together with the house especially built for it. Among many other honors Mesdag received the cross of the Legion of Honor in 1889.—His wife, SIENTJE MESDAG-VAN HOUTEN (1834–1909), was also a painter of impressionistic tendencies. Consult: Zilcken, *Hendrik Willem Mesdag* (Eng. ed., London, 1896); *Dutch Painters of the Nineteenth Century*, vol. ii, edited by Rooses (ib., 1898–1901); Marius, *Dutch Painting of the Nineteenth Century* (Eng. trans., ib., 1908).

MES'EMBRYA'CEÆ (Neo-Lat., from Gk. μεσημβρία, *mesēmbria*, midday, from μέσος, *mesos*, middle + ἡμέρα, *hēmera*, day; so called because the flowers of many species open only during midday). A family of dicotyledonous herbs or shrubs, now generally called Aizoaceæ. They are mostly natives of warm regions and include about 24 genera and 500 species. The family belongs to the Centrospermales, an order which begins with Chenopodiaceæ (goosefoot family) and culminates in the Caryophyllaceæ (pink family), an order characterized by its conspicuous perisperm. *Mesembryanthemum* is much the largest genus of the family, comprising about 300 species, which form a very characteristic feature of the flora of South Africa. Two genera are represented in the flora of North America, viz., *Sesuvium*, the sea purslane, two species of which occur on sandy beaches and alkaline plains; and *Mollugo*, the carpet weed, which occurs as a weed in waste places and cultivated grounds throughout North America. The leaves of some species, when burned, yield soda in great abundance. Large quantities of barilla are made from them in the Canary Islands, in Spain, and in Egypt. The seeds of some, as the ice plant (*Mesembryanthemum crystallinum*), and of *Mesembryanthemum geniculiflorum* are ground into flour to make bread. *Mesembryanthemum geniculiflorum* is used as a potherb in Africa. The fruit of *Mesembryanthemum edule* (known as Hottentot figs) is eaten in South Africa, and that of *Mesembryanthemum æquilaterale* (pig's-faces) in Australia. *Mesembryanthemum anatomicum* is called kou by the Hottentots, who beat and twist up the whole plant, allow it to ferment, and chew it like tobacco. When nearly fermented it is narcotic and intoxicating. Some species of *Mesembryanthemum* are common annuals in flower gardens.

MESEN, mā'zyĕn. A river in Russia. See MEZEN.

MESEN'TERON. See ALIMENTARY SYSTEM.

MES'ENTERY AND ITS DISEASES. The mesentery derives its name from being connected to the middle portion (Gk. μέσον) of the small intestine (ἔντερον). It is a broad fold of peritoneum (the great serous membrane of the abdomen) surrounding the jejunum and ileum and attached posteriorly to the vertebral column. Its breadth between the intestinal and vertebral borders is about 4 inches, its attachment to the vertebral column is about 6 inches in length, and its intestinal border extends from the duodenum to the end of the small intestine. It serves to retain the small intestines in their place, while at the same time it allows the necessary amount of movement, and it contains between its layers the mesenteric vessels, the lacteal vessels, and mesenteric glands. These lymph glands are 100 to 150 in number and are about the size of an almond. They elaborate the contents of the lacteals, the chyle being more abundant in fibrin and corpuscles after it has passed through them. The most important affection of these organs is their tubercular degeneration, which gives rise to *tabes mesenterica*, a disease most common in childhood, but confined to no period of life. It may be associated with tubercular infection of other parts of the body, such as pulmonary consumption, tubercular peritonitis, or caries of the spine; but sometimes the mesenteric glands are exclusively affected. The leading symptoms are loss of color and flesh, diarrhœa, and occasional vomiting, pain in the region of the navel, increased by pressure, tumefaction and hardness of the abdomen, with general emaciation. The enlarged glands can sometimes be detected by careful palpation, especially in advanced cases and when the peritoneum is also involved. The progress of the disease is generally slow.

The treatment mainly consists in the administration of cod-liver oil, tonics, and laxatives. When the disease has advanced to a considerable extent, medicines are of little use, except to palliate some of the more urgent symptoms.

Independently of the disease that has just been noticed, inflammation of these glands is by no means uncommon when the mucous membrane

of the small intestine is ulcerated, as, e.g., in typhoid or enteric fever.

The mesentery may be the site of hemorrhages, as in aneurism or some infectious diseases, as smallpox; of embolism or thrombosis; of cysts or of tumors. See also PERITONITIS.

MESGOUAT, TROÏLUS DE. See ROCHE, TROÏLUS DE MESGOUAT.

MESHA, mē′shȧ (Heb. *Mēshaʿ*). King of Moab during the reigns of Ahab and his sons, Ahaziah and Jehoram, kings of Israel. (2 Kings iii. 4, 5.) According to his inscription, found at Dhiban, Mesha shook off the yoke of Israel and freed himself from the heavy tribute imposed upon him in the middle of the reign of Ahab, and this is regarded by many historians as more correct than the statement in 2 Kings iii. 5 that the revolt took place after the death of Ahab. Subsequently, however, Jehoram secured the aid of Jehoshaphat, King of Judah, his father's ally, or vassal, and the united armies of the two kings were joined by the forces of the King of Edom. The Moabites were defeated, and the King took refuge in Kir-hareseth, his last stronghold. (2 Kings iii. 6–25.) Having in vain attempted to force his way through the besieging army, he withdrew to the wall of the city, and in the sight of the allied host offered up his first-born son and successor as a propitiatory sacrifice to Chemosh, the national god of the Moabites. The biblical narrative suggests (ib., 26–27), though in a vague way, that Chemosh turned to the succor of Mesha; at all events the Moabites remained masters of the situation, and the attempt to reduce them to subjection failed, though their land suffered much in the struggle. The famous inscription of Mesha seems to come from the period after the death of Ahab (c.851 B.C.) and before the invasion of the allied kings (c.849 B.C.). See MOABITE STONE.

MESHHED, mĕsh′ĕd, or **MESHED**. Capital of the Province of Khorasan, Persia, situated 3800 feet above the sea, in the extreme northeastern part of the country, 460 miles east of Teheran (Map: Persia, J 4). The city is surrounded by a mud wall. It owes its chief importance to the fact that it contains the tomb of the Imam Riza, a descendant of Ali, the founder of the Shiites. The tomb is contained in a mosque which is one of the most magnificent buildings in the East, richly ornamented with gold, silver, and marble. It is visited annually by more than 100,000 pilgrims. The shrine with adjacent territory is sanctuary for criminals. The city is also the centre of several important caravan routes and had a very extensive transit trade with India and Central Asia, which, however, has greatly decreased since the completion of the Russian railroad from the Caspian Sea to Samarkand and the adoption of adverse customs regulations by the Russian authorities. The town still manufactures and exports fine silks, carpets, shawls, and sword blades. Pop., about 60,000.

MESHHED-HOSEIN, mĕ′shĕd hō-sān′. A town of Asiatic Turkey. See KERBELA.

MES′MER, FRANZ, or FRIEDRICH-ANTON (1733–1815). A physician and founder of the doctrine of animal magnetism, or mesmerism (q.v.), born at Iznang on Lake Constance. He studied theology at Ingolstadt and medicine at Vienna, where he took his degree in 1766. About 1772 he began, along with Father Hell, to investigate the curative powers of the magnet, and was led to adopt the opinion that there exists a power similar to magnetism, which exercises an extraordinary influence on the human body. This he called animal magnetism, and published an account of his discovery and of its medicinal value in 1775. Honors were conferred upon him in Germany. In 1778 he went to Paris, where he attracted much attention and made a fortune by his famous magnetic cures. His system obtained the support of members of the medical profession as well as of others, but he refused an offer of an annual pension of 20,000 livres (about $4000) to reveal his secret; and this, combined with other circumstances, gave rise to suspicion and induced the government to appoint a commission, composed of physicians and scientists, whose report was unfavorable to him. He now fell into disrepute, and after a visit to England retired to Meersburg, where he spent the rest of his life in obscurity.

MES′MERISM. The name of the process by which, towards the end of the eighteenth century, Franz Mesmer (q.v.), promulgator of the doctrine of animal magnetism, induced the so-called mesmeric trance or sleep. Since Mesmer's day the subject has been transferred from the domain of charlatanism to that of scientific research. The mesmeric trance is identical with the condition known to-day as induced somnambulism, or hypnotism, or the hypnotic state; it has presented to the observer many highly interesting phenomena. In persons who are favorably disposed for passing into the hypnotic state the condition is easily induced by weak, long-continued, and uniform stimulation of the nerves either of sight, of touch, or of hearing. This state is, on the contrary, almost always easily capable of being brought to a close by some strong or suddenly varying stimulation of the same nerves.

The scientific study of the phenomena presented by hypnotized persons is of great interest and has a definite though very limited sphere of usefulness in the cure of mental and functional disorders. Actual harm may result from the practice of hypnotism upon some nervous and impressionable persons. Moreover, the number of those susceptible to its influence is so small that its general use is impossible. For obvious reasons, women should never be hypnotized without reliable witnesses, and the public use of hypnotism can only appeal to the morbid. Hypnotism tends to destroy self-reliance and to make patients imaginative, weak-minded, and neurasthenic. Suggestion (q.v.) is a mighty aid to the physician, and without producing hypnosis, positive and intelligent assertion can accomplish all that is likely to be done by hypnotism short of the somnambulistic stage. A fair realization of the part suggestion plays in therapeutics is one of the recent achievements of the most progressive medical minds. See HYPNOTISM; MENTAL SCIENCE; PSYCHOTHERAPY; SOMNAMBULISM; SPIRITUALISM; SUGGESTION.

MESNE (mēn) **LORD.** In English law, a landlord of whom lands are held in fee who is himself tenant in fee to some superior lord. The lord of a manor containing freehold lands which are held of him in fee, and who in his turn holds his lands of the crown, answers that description at the present time; the superior lord, in this case the King, being the lord paramount. See FEE; FEUDALISM; TENURE.

MESNE PROCESS. All writs, process, or orders made or issued in an action between its commencement by original writ, summons, or

other primary process and the final process by which the judgment of the court is enforced. This term is not employed under modern practice acts in the United States, but is still employed in the "common-law States" and in England. In the "code states" such process is now included in that covered by the term "interlocutory order, judgment, or decree." See EXECUTION; JUDGMENT; SUMMONS; WRIT.

MESNE PROFITS. The reasonable value of the use and occupation of real property during the period in which a trespasser remains in possession, and which may be recovered by the true owner as an incident to his judgment in ejectment. The mesne profits cover the revenue derived by the trespasser from the land during the period of his wrongful possession, including the value of crops gathered, timber cut, etc., as well as the rent received by him. In the ordinary case the mesne profits are estimated by taking the fair and reasonable net rental value of the premises between the original entry by the trespasser and the restoration of the owner in possession and deducting therefrom all reasonable and necessary expenses for repairs and improvements incurred by the trespasser and the amount of any taxes or assessments paid by him. See DAMAGES; EJECTMENT.

MES'OHIP'PUS (Neo-Lat., from Gk. *μέσος, mesos,* middle + *ἵππος, hippos,* horse). A name sometimes applied to one of the fossil horses of Miocene age. See HORSE, FOSSIL.

MESOINOSITE. See INOSITE.

MES'OLITE (from Gk. *μέσος, mesos,* middle + *λίθος, lithos,* stone). A hydrated sodium-calcium-aluminium silicate that is intermediate in composition between natrolite and scolecite and apparently crystallizes in the triclinic system. It occurs crystallized, in fibrous masses, and sometimes massive, with a vitreous lustre, and in color is white or of light shades of gray or yellow. Mesolite is found in amygdaloid and other volcanic rocks, especially in Iceland, Scotland, in Pennsylvania and Colorado in the United States, and in Nova Scotia.

MESOLONGHI, mĕs'ō-lŏn'gē. A town of Greece. See MISSOLONGHI.

MESONERO Y ROMANOS, mā'sō-nā'rō ē rō-mä'nōs, RAMÓN DE (1803–82). A Spanish essayist, born at Madrid. He entered first upon a mercantile career and while thus engaged he collected the material for his *Manual de Madrid.* As a journalist, he collaborated on the *Cartas Españolas,* and in 1836 he established the *Semanario Pintoresco Español,* which he continued to direct until 1842. The best of his essays are to be found in the volumes entitled *Escenas matritenses* (2 vols., 1836) and *Memorias de un setentón* (1880). Those contained in the former collection give faithful pictures of older Madrid, and therefore have a decided antiquarian value; those included in the *Memorias* present much matter that is now very useful to an understanding of the political, social, and literary aspects of the time. Consult: the edition of his *Obras completas* (8 vols., Madrid, 1881); *Trabajos no coleccionados* (2 vols., ib., 1903, 1905); and a good bibliographical note in G. T. Northup, *Selections from Mesonero Romanos* (New York, 1913).

MES'ONYX (Neo-Lat., from Gk. *μέσος, mesos,* middle + *ὄνυξ, onyx,* nail). A fossil creodont mammal found in the fresh-water Eocene formations of Wyoming and New Mexico. A complete skeleton has been mounted in the museum of Princeton University. It shows the animal to have had a large head, with strong jaws and stout teeth which were able to crush bones. The body is more bulky in front and smaller and weaker behind, with a remarkably long and powerful tail. It resembled in some superficial respects the modern Tasmanian wolf.

MESOPH'ILOUS PLANT (from Gk. *μέσος, mesos,* middle + *φίλος, philos,* dear, from *φιλεῖν, philein,* to love). An objectionable term for plants which grow in intermediate conditions. "Mesophytic" is preferable. See MESOPHYTE.

MES'OPHYLL (from Gk. *μέσος, mesos,* middle + *φύλλον, phyllon,* leaf). The characteristic tissue of a foliage leaf, including all of the tissues of a leaf excepting the epidermis and the veins. The mesophyll cells contain chloroplasts, and therefore are the cells of the leaf engaged in the manufacture of carbohydrates. In leaves of ordinary exposure the mesophyll is differentiated into two regions: (1) palisade tissue, which develops on the upper side of the leaf and consists of elongated cells standing close together and with their long axes at right angles to the plan of the leaf; and (2) spongy tissue, which is developed on the lower side of the leaf and consists of cells loosely arranged, so as to leave a labyrinth of intercellular spaces. In some cases groups of mesophyll cells may become water-storage tissue, in which case they may lose the green pigment. A general term, applied to all green tissue, whether in the foliage leaf or elsewhere, is chlorenchyma (q.v.). In the foliage leaf chlorenchyma and mesophyll are usually synonymous, but the former is the name of a distinct tissue, while the latter is a name of position and may include more than one tissue. See LEAF.

MES'OPHYTE (from Gk. *μέσος, mesos,* middle + *φυτόν, phuton,* growth, plant). A name given to plants which grow naturally in conditions of intermediate soil moisture. The term is thus in contrast with hydrophyte and xerophyte (qq.v.). To this group belong the most common plants of the forest and grass lands of equable climates. Cultivated areas with very few exceptions are mesophytic. Hydrophytes and xerophytes, then, may thus be regarded as extremes, the one adapted to an extreme of moisture, the other of dryness. On account of the almost uniformly favorable conditions mesophytes are able to survive without any striking adaptations such as are to be found among xerophytes and hydrophytes. However, with the exception of a few remarkably plastic hydrophytes, they exhibit maximum plasticity. It is perhaps not surprising that plasticity is found developed to a high degree among them, the sequence of periods of extreme moisture or extreme dryness tending to rigidity of structures. The vegetation of mesophytic areas is much more dense than that in xerophytic or even in hydrophytic regions, and there is a far greater wealth of species. The struggle for existence is thus more keen, and fewer representatives of the various species may be found, while a xerophytic or hydrophytic plant society may often be characterized by the dominance of one or two species. The keen competition which exists in mesophytic regions may perhaps account for the survival of forms with a high degree of plasticity. The various mesophytic societies are treated under the following heads: FOREST; MEADOW; PASTURE; PRAIRIE.

MES'OPOTA'MIA (Lat., from Gk. *μεσοποταμία,* sc. *γῆ, gē,* country, country between the

rivers, from *μέσος, mesos*, middle + *ποταμός, potamos*, river). In the widest sense, all the country between the Tigris and Euphrates rivers from Armenia to the Persian Gulf; in a narrower and more proper usage, the northern part of this territory, called to-day by the Arab name El Jezirah (the island peninsula), the southern portion (Babylonia) being known as Irak Arabi. In the Old Testament this territory is called Aram Naharayim (the Aram of the two rivers) and Padan Aram (the plain of Aram). The name, in the form Nahrina, is found in Egyptian inscriptions and in the Amarna letters. Concerning the earliest history of Mesopotamia cuneiform descriptions have as yet given no information. If Uspia and Kikia of Asur were Hittites (see ASSYRIA), it is possible that this Asianic people invaded Mesopotamia before the Assyrians carried their arms through the country into Cappadocia in the twenty-third century B.C. The Hittites, who in 1932 B.C. overthrew the first dynasty of Babylon (see BABYLONIA), are likely to have established themselves in Mesopotamia. In the fifteenth and fourteenth centuries the ruling power was the Mitannians (q.v.). Samsi Adad II (c.1870–1840) had already built a temple to Dagan in Tirka, south of the Khabur. After the decline of the Mitannian power Shalmaneser I (c.1320–1290) conquered northern Mesopotamia, and in the treaty between the Hittite King Dudhalia and the Amorite Benteshina Assyria appears as suzerain in Mesopotamia. Soon after this Aramæan tribes seem to have settled in the land, and strong kingdoms like the Bit Adini established themselves until Shalmaneser III (860–825) and his successors made themselves masters of Mesopotamia. The most important city in the Assyrian period was Haran. In the division between Media and Chaldæa after the fall of Assyria in 606 Mesopotamia fell to the latter. In 538 it passed under Persian rule, and later belonged successively to the Seleucid and Arsacid empires. The chief cities of this period were Edessa and Harran. (See EDESSA; OSRHŒNE.) The Romans made it a province. In 363 Jovian surrendered most of it to Persia. In the seventh century it came into the hands of the caliphs. After 1055 much of the land was ruled by petty Seljukian sultans. These were in turn conquered by the Mongols, who captured Bagdad in 1258. The Osmanlis began their conquest early in the sixteenth century and in 1638 the land passed completely into their power. At present the population is mainly Arab; most of the tribes are as independent of the Turkish government as their brethren in central Arabia, though the country is nominally divided between several Turkish vilayets. There are a few Kurds in the north and a small number of Armenian and Syrian Christians. The land is hilly in the north, but low and sandy to the south. After the Euphrates and Tigris, the chief rivers are the Khabur, Jaghjagha, and Belikh. Bitumen is common and a few petroleum wells are found. The most important towns are Urfa, Mardin, Nesibin, Mosul, El Deir, and Rakka. In early times, when a good irrigation system was maintained, the land was fertile, populous, and the home of an advanced civilization. Owing to its situation, it was open to influences from both the east and the west, from Babylonia and Asia Minor. Perhaps its most prosperous time was under Assyrian and Babylonian rule, but in the early Christian centuries it contained important cities, such as Edessa and Nisibis. To-day it is desert except along the banks of the natural watercourses.

Bibliography. Oppert, *Expédition scientifique en Mésopotamie* (Paris, 1856–59); Lady Anne Blunt, *The Bedouin Tribes of the Euphrates* (London, 1880); Eduard Sachau, *Reise in Syrien und Mesopotamia* (Leipzig, 1883); Oppenheim, *Vom Mittelmeer zum persischen Golf* (Berlin, 1899); Guy Le Strange, *Lands of the Eastern Caliphate* (Cambridge, 1905); Louis Massignon, "Mission en Mesopotamie, 1907–08" in *Institut français d'archéologie orientale du Caire, Mémoires*, vols. xxviii, xxxi (Cairo, 1910–12); E. B. Soane, *To Mesopotamia and Kurdistan in Disguise* (London, 1912), containing a bibliography. See ASSYRIA; BABYLONIA, where the works dealing with the earlier history will be found.

MES'OZO'A (Neo-Lat. nom. pl., from Gk. *μέσος, mesos*, middle + *ζῷον, zōon*, animal). A group of animals regarded as intermediate between the Protozoa and Metazoa. The name was proposed in 1876 by E. van Beneden for a group of filiform bodies living in the liquid bathing the "spongy bodies" or venous appendages (kidneys) of cephalopods. They resemble Infusoria, but are two-layered and pass in their development through a gastrula stage. They were named Dicyema by Kölliker, who, with others, considered them as parasitic worms. Van Beneden regarded these forms as constituting the type of a distinct branch or phylum of the animal kingdom. These mesozoans are represented by two types of individuals, differing externally; one (nematogene) producing vermiform embryos, the other form (rhombogene) infusoriform (but many-celled) young. Packard suggested that Dicyema and allies may be degenerate parasitic platyhelminths derived originally from some low cestode or trematode worm. Parker and Haswell (1897) treat of them in an appendix to the Cœlenterata and state that it has been proposed to call them the Planuloidea, from the resemblance which they bear to the planula larva of the cœlenterates. Sedgwick (*Text-Book of Zoölogy*, 1898) is inclined to regard them as allied to the Trematoda, to the miracidium larva to which he asserts "they do present some considerable resemblance." Consult E. R. Lankester (ed.), *A Treatise on Zoölogy*, part iv (New York, 1903).

MES'OZO'IC ERA. One of the main divisions of geologic time, following the Paleozoic era and preceding the Cenozoic era. It is subdivided into the Triassic, Jurassic, and Cretaceous periods. See GEOLOGY.

MESPELBRONN, JULIUS ECHTER VON. See JULIUS ECHTER VON MESPELBRONN.

MESQUITE (mĕs-kē'tâ) **GRASS** (Sp. *mezquite;* probably of Mexican origin). A name applied to a number of low-growing tufted grasses that occur in greater or less abundance upon the extensive ranges of the western and southwestern parts of the United States. Species of Aristida and Boutelona are among the mesquite grasses, *Boutelona oligostachya* and *Boutelona curtipendula* being the best known. Curly mesquite is *Hilaria cenchroides*. It forms a dense sward with leafy stems a few inches to a foot high. It matures standing, as do the other species, and is excellent fodder until rotted by the winter rains. While valuable for grazing, it is too low growing to be cut for hay.

MESQUITE TREE (*Prosopis juliflora*). A shrub or tree belonging to the family Legumi-

nosæ, found from central Texas to eastern California, and southward through Mexico and Central America to Chile and Argentina, and also in Jamaica. It is also known as honey locust, honey pod, algaroba, and has been introduced in the Hawaiian Islands, where it is highly prized for its timber, shade, and for its pods, which are an important stock food. In the United States the tree attains its best development in the valleys of western Texas, New Mexico, and Arizona. In some places it is the only tree. According to some botanists the shrubby form is the species while to the larger tree of Arizona and Sonora the name *Prosopis juliflora velutina* is given. There is some doubt regarding the specific identity of the Hawaiian tree. According to its surroundings, the mesquite varies from a straggling, spiny shrub to a widely branched tree 50 feet high and 3 feet in diameter, the latter size being attained in rich valleys where water is available to the deeply penetrating roots. When once established it withstands extreme heat and drought. The wood is exceedingly durable and is much used for posts, house

MESQUITE TREE.

foundations, and similar structures, as well as for fuel. The leaves, which are eaten by stock, have about the same composition as alfalfa hay. The pods, which grow in clusters of from 2 to 10 and are from 4 to 8 inches long, are slender, white or yellow, contain a number of small hard seeds, and are rich in sugar, on which account they are eagerly eaten by cattle, horses, and mules. When eaten without preparation much of the nutritive value is lost, since the seeds are voided without being digested; but when gathered, dried, and ground their value is greatly increased, since the nitrogenous beans are saved. Two forms of gum are produced by the mesquite tree. One, resembling gum arabic, exudes as small clear or amber-colored drops from the trunks. It makes an excellent mucilage, and has been employed in laundries and for confectionery. The other, obtained from wounds in the trunks, occurs in black, brittle, larger masses. It contains as much as 20 per cent of tannin, and with some form of iron is used by the Mexicans as a black dyestuff. During the flowering period, which lasts for about two months, the trees are visited by bees for the abundant nectar, which makes a clear honey of very agreeable flavor. Mexicans make a cathartic by pounding the inner bark in water and adding salt to the mixture. A second species, *Prosopis pubescens*, is known as the screw bean or curly mesquite. It is a shrub or small tree growing in situations similar to the previous one. Its pods are spirally curled into close rigid cylinders. The uses of this species are very similar to those described above.

MESS (OF. *mes*, Fr. *mets*, dish (of food), It. *messo*, *messa*, course at table, from Lat. *missus*, p.p. of *mittere*, to send). A military and naval term originally signifying a dish or portion of food, but now used in the sense of a number or association of officers or men taking their meals together. The officers' mess or messes at an army post in the United States army are established and have quarters assigned for such purpose, under the supervision of the commanding officer. In campaign company officers usually mess with their organizations. Battalion officers mess with the companies or provide their own. The regimental commander and his staff form one mess or may mess with the band. To reduce transportation the superior commander may require all officers to mess with organizations. Whenever possible the enlisted men mess together by companies, under the supervision of the captain. An officer appointed by the post commander has charge of the "general mess" for enlisted men when such a mess is authorized and created by combining several companies. In campaign enlisted men mess by company when possible. Often it is necessary to mess in squads or have individual cooking.

The system of messing, as regards the soldier, is practically the same throughout Europe, varying in comfort and food according to the country and army organization.

On board ship the admiral messes alone or with the captain, if agreeable to both. The ward-room mess includes all ward-room officers. The junior officers (ensigns, if not in the ward room, naval cadets, pay clerks, etc.) have a separate mess room, as have also the warrant officers (boatswains, gunners, carpenters, warrant machinists, pharmacists). The enlisted force in most ships forms the "general mess." The men are divided into convenient units or messes, according to the size of the tables; the chief petty officers and those of the first class have their own tables, and when possible are granted special privileges in their messing arrangements. In ships on board which the "general mess" system has not been established the crew is divided into several messes, according to the number.

To each officers' mess in the navy are allotted a cook, steward, and servants, the number of the latter depending upon the number of officers in the mess. The servants (or mess attendants, as they are called) are not merely waiters and personal attendants, but in action they are ammunition passers.

MESSA DI VOCE, mĕs′sȧ dē vō′chȧ (It., setting of the voice). A term used in the art of singing, meaning the gradual swelling and again diminishing of the sound of the voice on a note of long duration.

MESSAGER, mē′sȧ′zhȧ′, André Charles (1853–). A French composer and conductor, born at Montluçon. He began his musical studies at the Ecole Niedermeyer in Paris and completed his training under Saint-Saëns. In 1876 he won the prize offered by the Société des Compositeurs Français for the best symphony.

For a number of years he was organist at St. Paul's in Paris, until the success of some lighter operas secured him the position of conductor at the Opéra Comique in 1898. From 1901 to 1907 he was the artistic director at Covent Garden. In 1907 he was appointed first conductor at the Grand Opéra in Paris, and at the same time joint director with Broussan. He resigned the directorship in 1914, but continued as conductor. He directed the first Paris performance of *Parsifal*. In 1908 he succeeded Marty as conductor of the Concerts du Conservatoire. His compositions (almost exclusively operas) include *La fauvette du temple* (1885); *La basoche* (1890); *Mme. Chrysanthème* (1893); *Le Chevalier d'Harmental* (1896); *Les petites Michus* (1897); *Véronique* (1898); *Les dragons de l'impératrice* (1905); *Fortunio* (1907); *Béatrice* (1914).

MESSA'LA CORVI'NUS, MARCUS VALERIUS (c.70 B.C.–c.1 B.C.). A Roman soldier, orator, and patron of letters. He was educated in part at Athens, and, having returned to Rome after Cæsar's assassination and previous to the formation of the second triumvirate, became a member of the Senatorial party. He was third in command of the Republican army at Philippi, and stormed the camp of Octavius, whom he almost captured. Having escaped, with a fairly well organized force, to the island of Thasos, he later accepted terms from Antony, against whom, however, at Actium, he brilliantly commanded the centre of Octavius' fleet, and whose abrogated consulship he filled (31 B.C.). Appointed proconsul of Aquitania, he completed the reduction of that province and received a triumph. He was also at one time a prefect in Asia Minor, and became a special member of the College of Augurs. He was reckoned, with Gaius Asinius Pollio, the last orator of the old school. He was a liberal patron of men of letters, of a group distinct from that which gathered under the auspices of Mæcenas. Consult Wiese, *De Corvini Vita et Studiis Doctrinæ* (Berlin, 1829), and the article "Valerius, 43," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MESSALIANS. See MASSALIANS.

MES'SALI'NA, VALERIA. The most infamous woman in the annals of the Roman Empire. She was the daughter of M. Valerius Messala Barbatus, and third wife of the Emperor Claudius, whom she married before his accession in 41 A.D. (See CLAUDIUS I.) Taking advantage of the weakness and stupidity of the Emperor, she indulged in the most wanton and flagrant atrocities, both moral and political. If we are to judge by the Roman historians, her character was unspeakably vile, and her boundless ambition could be satisfied only with the destruction of all who seemed to thwart her plans. The best blood of Rome flowed at her pleasure. She retained her influence over the Emperor, who remained unaware of her infidelities; but when, during a short absence of Claudius from Rome, she actually committed the folly of going through the forms of a public marriage with C. Silius, whom she had compelled to divorce his wife, the affair was brought to the Emperor's attention by the freedman Narcissus, and Claudius reluctantly gave orders for her death. She was killed by a tribune of the guards, 48 A.D. Consult: Stahr, *Römische Kaiserfrauen* (Berlin, 1865); Tacitus, *Annales*, xi, 1–38; *Juvenal*, vi, 115–135; x, 333; xiv, 331; J. B. Mayor on *Juvenal* at the places cited.

MESSANA. See MESSINA.

MESSA'PIA (Lat., from Gk. Μεσσαπία). The name applied by the Greeks to Calabria (in the classical sense), a peninsula in the southeastern part of Italy, extending from Tarentum to the Iapygian Promontory. The chief towns were Rudiæ, where Ennius (q.v.) was born, Brundisium (see BRINDISI), Uria, and Uzentum. The Messapii, inhabitants of this part of the country, were known also as the Iapyges, or Iapygii. Their language survives in some inscriptions, about 50 or 60 in number, consisting mostly of proper names. On these consult: Theodor Mommsen, *Die Unteritalischen Dialekte* (1850); A. Torp, *Indogermanische Forschungen*, vol. v (1895); R. S. Conway, *The Italic Dialects* (2 vols., Cambridge, 1897); I. P. Droop, *Annual of the British School at Athens*, vol. xii (Athens, 1905–06).

MESSENE, mĕs-sē'nē (Lat., from Gk. Μεσσήνη). The capital of Messenia, in the Peloponnesus, founded by Epaminondas (369 B.C.) (Map: Greece, Ancient, B 3). It lay at the foot of Mount Ithome, surrounded by a stone wall 5½ miles long and of great strength. This wall is still well preserved in places, especially at the Arcadian Gate, which is an exceptionally fine example of Greek fortification. The stadium, theatre, and other ruins can be easily traced, and excavations in 1895 by the Greek Archæological Society brought to light a fine colonnade and other remains of the ancient agora.

The town was settled by the descendants of the ancient Messenians (see MESSENIA), whom Epaminondas invited to return, and was therefore the hereditary enemy of Sparta, contributing not a little to the continual internecine strife which marks the history of the Peloponnesus from the middle of the fourth century B.C. to the Roman conquest. The modern Messene, or Nisi, is some distance from the ancient site, which is partly occupied by the little village of Mavromati. Consult K. Baedeker, *Greece*, pp. 410–412, with plan (4th Eng. ed., Leipzig, 1909).

MESSE'NIA (Lat., from Gk. Μεσσηνία). A district in the southwest part of the Peloponnesus, bounded on the east by Laconia, on the north by Arcadia and Elis, and on the south and west by the sea (Map: Greece, Ancient, B 3). It consisted of extensive plains, watered by the Pamisus and other streams. These plains were famous for their fertility, and particularly for their wheat harvests. At an early period, after the Doric conquest (see DORIANS), it rose to power and opulence. Its chief cities were Methone and Pylos. In late times Messene was the capital. Messenia is chiefly noted for its two wars with Sparta, known as the Messenian wars, the first of which seems to have occurred in the eighth century B.C., the second (of which Aristomenes is represented as the hero) in the second half of the seventh century B.C., though the authorities on which our accounts of both wars rest are far from satisfactory. In both instances the Messenians were defeated, and after the second war a part of the population emigrated to Sicily. The peopling of Messana (see MESSINA) was much later. The remainder of the inhabitants were reduced to the position of helots. A revolt of the latter, who fortified themselves on Mount Ithome and held out for 10 years, is known as the Third Messenian War (464–455 B.C.). The invasion of the Peloponnesus by Epaminondas in 370–369 led to the

return of the Messenians to their land (see MESSENE) and the revival of their old state, which continued independent, though in alliance at times with the Macedonians, until the Roman conquest (146 B.C.). Messenia is the name of one of the nomarchies of the modern Kingdom of Greece, with Kalamata as its capital. Consult: C. Bursian, *Die Geographie von Griechenland*, vol. ii (Berlin, 1868); A. Philippson, *Der Peloponnesus* (ib., 1892); J. G. Frazer, *Pausanias*, vol. iii (2d ed., New York, 1914).

MESSI'AH (transliterated in Gk. Μεσσίας, *Messias*, or Μεσίας, *Mesias*, from Aram. *Meshiha*, the *h* having been slurred over in pronunciation, the equivalent of Heb. *ha-Mashiah*, the anointed, translated into Gk. χριστός, *Christos*, Christ). A title given to the king or pontiff in ancient Israel and Judah because of his anointment as vicegerent of the deity and ruler of the people, and in later times a designation of the expected deliverer from foreign oppression and founder of a world-wide Jewish empire. Saul (1 Sam. xii. 3, 5, xxiv. 7, 11), David (2 Sam. xix. 21, xxiii. 1), and Zedekiah (Lam. iv. 20) are spoken of as Yahwe's anointed. In Isa. xlv. 1 the title seems to be applied to Cyrus; doubts, however, have been expressed, both on metrical and other grounds, as to whether the words "to Cyrus" formed a part of the original text. (See ISAIAH.) The anointed priest referred to in Lev. iv. 3, 5, 16 is clearly the high priest, who, during the Persian period, was the head of the state and therefore was spoken of as the Messiah, the anointed one, quite as naturally as the kings of preëxilic times. The same custom evidently continued in the Ptolemaic and Seleucid periods, as Joshua ben Jozadak is alluded to as the anointed prince in Dan. ix. 25, and the cessation of the legitimate high-priesthood is expressed by the phrase "the anointed is cut off" in Dan. ix. 26. (Cf. Wellhausen, *Israelitische und jüdische Geschichte*, 7th ed., p. 234, Berlin, 1914.) The priest kings of the Hasmonæan dynasty, as possessors both of the throne of David and the pontificate, naturally received this title. (See MACCABEES.) Ps. xviii. 50, xx. 6, xxviii. 8, lxxxiv. 10, lxxxix. 39, 52 are regarded by many scholars as referring to some of these rulers, though it is doubtful in some instances whether one of the actual kings, Aristobulus I and Alexander Jannæus, or a princely pontiff like Jonathan, Simon, or John Hyrcanus is meant. There appears to be no passage in the Old Testament in which the title is unmistakably used with reference to a future monarch. It has been thought, however, that this is only an accident, and that such an eschatological figure is alluded to here and there under other names. Thus, Shiloh (Gen. xlix. 10), the star (Num. xxiv. 17), the Prince of Peace (Isa. ix. 6), the branch (Isa. xi. 1), Immanuel (Isa. vii. 14), the righteous Shoot (Jer. xxiii. 5), my servant David, and the shepherd (Ezek. xxxiv. 23, xxxvii. 24) have been considered by some scholars as possibly designating the Messiah. They have sought a justification for expecting such veiled allusions in certain Babylonian and Egyptian prophecies that have recently come to light and seem to them to point to analogous eschatological speculations among the nations by which Israel and Judah were influenced. Thus, Zimmern has called attention to a cuneiform inscription describing a time of prosperity when a righteous king shall reign over the land. (*Zum Streit um die Christusmythe*, Leipzig, 1910.) A Petrograd papyrus, a wooden tablet at Cairo, and an ostracon at Liverpool contain a prophecy which is said to have been made by a priest in the time of Snefru, but probably belongs to the twelfth dynasty, predicting (ex eventu) the power and prosperity of the founder of this dynasty, Amenemhat I. The admonitions of the sage Ipuwer to a king of the nineteenth dynasty in a Leyden papyrus, published by Gardiner (*The Admonitions of an Egyptian Sage*, Leipzig, 1909) and interpreted also by Breasted (*Religion and Thought in Ancient Egypt*, New York, 1912), speak of a shepherd of men in whose heart there is no evil, and ask "Where is he to-day? Doth he sleep perchance? Behold his might is not seen." The text is obscure, and it is not clear whether the sun god Re, or a future king, or even the monarch addressed is intended. While these texts are fragmentary, of doubtful interpretation, and insufficient to prove a connection of prophetic speculation in general, and the Messianic idea in particular, with Babylonian and Egyptian thought, there is nothing strange in the expression of the hope for a good king, and it would not be remarkable if certain designations of a great and noble ruler should prove to have been used by different peoples, independently or through imitation. Nor can it be affirmed a priori that the Hebrews could not have associated with kingship, present or future, that divine character which is so clearly assigned to it in ancient Egypt at all times and in Babylonia in the earliest periods. But thus far the evidence adduced is quite inconclusive. It is by no means certain that Shiloh is a name; the star in Balaam's oracle seems to point to David; Immanuel appears very clearly to be the name which a woman in Isaiah's time, expecting soon to be a mother, will give to her child; a descendant of the old royal family living in the exile seems to be referred to in Isa. ix. 6, xi. 1; and the same is likely to be the case with the passages in Jeremiah and Ezekiel alluding to my servant David (a David redevivus), the righteous Shoot, and the shepherd. As ampler material for such comparative study of ancient eschatology is brought to light it is possible that one or the other of these terms may appear more likely than is the case to-day to be veiled allusions to the Messiah. Critical scholars find it extremely difficult to discover any passage in the Hebrew Bible that refers to the Messiah as a future deliverer. The Psalter of Solomon, however, can no longer be pointed out as containing the earliest distinct and unmistakable reference to this Messiah; for it is probable that the Documents of the Covenanters of Damascus, published by Schechter (*Fragments of a Zadokite Work*, Cambridge, 1910), in which the hope of a coming Messiah is expressed, were written as early as c.100 B.C., and the sect to whose tenets this belief no doubt belonged from the beginning was formed soon after the overthrow of the legitimate Zadokite pontificate by the Tobiads in the reign of Antiochus IV (175–164 B.C.). The Messiah expected by these Covenanters was to come in the future from Aaron and Israel, not from David and Judah. Unless it hides under some cryptic forms, the figure of the eschatological Messiah would, therefore, seem to appear in literature as a coming high priest somewhat earlier than as a coming king.

But the elements out of which the Messiah as

an eschatological magnitude was formed had long been in existence. There had been a tendency to attach much importance to the anointing of rulers. From Saul to Zedekiah, from Joshua to Aristobulus II, the leader of the state, whether king, pontiff, or priest king, had been consecrated with oil. Originally unction was an application of sacrificial fat. The pouring of oil upon the stone in which the divinity dwelt was a sacrifice. The King was a holy being to whom this offering was made. With the anointing a spirit entered into him (1 Sam. xvi. 13); he was sacrosanct, his body must not be touched (1 Sam. xxiv. 10); he was gradually removed from the gaze of the people and seen only by his officials (2 Kings xix. 15). The pontiff as ruler of Israel was Yahwe's anointed, a son of oil (Zech. iv. 14), having access to the celestial court (Zech. iii. 7). It is held by some scholars that in the Hasmonæan age the priest king by virtue of his anointment was regarded as Yahwe's Son and as a god sitting on his throne. (Ps. xlv, lvii, lxxxii.) It is not considered strange by those holding this view that a victorious king engaged, as it seemed to his admirers, in the conquest of the world should at that time have been addressed as god by a court poet. (Ps. xlv. 6.) There had also been a tendency to repose extraordinary faith in the dynasty founded by David. The reason for this may have been its remarkable longevity; perhaps also its promised prosperity. As long as princes of this family lived and received signal honors at the hands of Chaldæan and Persian kings, as was the case with Jehoiachin, Sheshbazzar, and Zerubbabel, the hope of national independence naturally connected itself with these shoots of the old stock. Thus, the elevation of Jehoiachin from his dungeon to royal dignity in 561 B.C., and the birth of his son, Sinapaluzur (Sheshbazzar), seem, according to some scholars, to have led a poet to express the hopes of Isa. ix. 1–6, xi. 1–6, and the presence of Jehoiachin's grandson, Zerubbabel (q.v.), as governor in Jerusalem at the beginning of the reign of Darius Hystaspis raised expectations of his restoring the old dynasty. (Hag. ii. 23; Zech. viii. 8, iv. 6 et seq., vi. 12.) The gradual disappearance of prominent members of the Davidic family no doubt gave room for independent aspirations. Sanballat (q.v.) may have been right when he declared that prophets in Jerusalem had announced Nehemiah as the coming King. (Neh. vi. 7.) Simon became Prince as well as high priest, and Aristobulus I King, without belonging to the Davidic family. But the strength of the legitimist feeling may be seen both in the fiction by which the occupant of David's throne was designated as his son, and in the indignant protest of the Pharisees against this fiction. This loyalty to the legitimate line, and the increasing difficulty of finding a leader who should also be a genuine descendant of David, necessarily removed into the future the Messianic King. Of great importance was also the tendency, always strong in Israel, to look beyond present conditions for better things to come. While the great prophets before the Exile announced impending judgment, there were always those who held up cheerful pictures of the future to the people. After the Exile it was especially the author of Isa. xl. et seq. who inspired hope and courage by his promises of good. He indeed did not look forward to a Messiah, but he did much to develop that apocalyptic mood out of which this figure was born. The same is true of the Book of Daniel, which seems to have been written in part in the third century and in part in the year 165 B.C. It reveals a marked growth of the apocalyptic imagery, but the Messiah holds as yet no place among its eschatological figures. The manlike being appearing on the cloud (chap. vii) is probably Michael, the celestial representative of Israel. The Maccabæan uprising and the establishment of a native dynasty encouraged this disposition to map out the future. But while Yahwe's anointed actually sat upon the throne of David and was conquering the neighboring nations, there was no reason for putting the Messiah in the future. The atmosphere of the Psalter is saturated with a desire for divine judgment upon the heathen nations and breathes a pathetic confidence in the dynasty occupying the Davidic throne. The enthusiasm seems to have been shared by the Egyptian Jews. In the *Sibylline Oracles* (iii, 652 et seq.) there seems to be a reference to Simon as a godsent king who will put an end to evil war. From the standpoint of the Erythræan Sibyl, Simon may be said to be a king sent from the sun, even as Cyrus is called a king from heaven (iii, 286). The passage was probably written in the time of Ptolemy IX, Euergetes II (145–117 B.C.). Ethiopic Enoch i–xxxvi, written in the reign of John Hyrcanus (135–104 B.C.), contains no allusion to a king, and Ethiopic Enoch xc, 37, 38 seems to be a late addition to the book lxxxiii–xc, which apparently was written c.106 B.C. An elaborate eschatology had thus been developed in which the Messiah, according to this view, held no place. On the other hand the overthrow of the Zadokite high-priesthood and the assumption of the pontificate by the illegitimate line of Tobiad and Hasmonæan rulers appear to have led the Zadokites to look hopefully for a Messiah from Aaron and Israel, i.e., a high priest of the old line, not a son of David and member of the tribe of Judah. But the way was prepared by veneration for the anointed ruler of the state, loyalty to the old dynasty, the Davidic or the Zadokite, and speculation about the world's future. Roman oppression caused a fusion of these elements. The anointed king that was needed must be a genuine son of David, and as no claimant to the throne of the legitimate line presented himself, he necessarily belonged to the future. The Roman yoke was all the more galling as the Jewish people had for a century indulged in a dream of empire and imagined itself in the midst of the actual conquest of the world. But even this cruel disenchantment could not quench the spark of ambition. The Pharisees saw the cause of the calamity in the Hasmonæan usurpation of the throne of David, as the *Psalter of Solomon* shows, and looked to God to provide the genuine Son of David, strengthening their faith by the prophetic word. They understood the Psalms of David to be songs indited by the great monarch, and naturally interpreted the language in which the actually reigning King had been referred to as prophecies of the coming Messiah. Similarly, the words of ancient prophets originally referring to their contemporaries of the Davidic family or to the dynasty itself were explained as divine announcements of the coming deliverer. But in spite of this support in the popular exegesis of the Bible, the Messianic hope seems to have been cherished only in limited circles. Whether the idea was influenced at the outset by

Mazdayasnian thought is doubtful; in its later development it may have borrowed some features from the Saoshyant (q.v.). This Persian Messiah has no political character. He was expected to raise the dead and to renew the world. (*Yasht*, xix, 92 et seq.) The Messianic idea seems to have had little hold upon the Alexandrian Jews. It is not certain that the translators of Isa. ix. 5 and Ps. cx. 3 had the Messiah in mind; in Num. xxiv. 7 the Davidic house is meant, and the rendering of Gen. xlix. 10, "he is the expectation of the nations," is not likely to be original. It is doubtful whether *Sibylline Oracles*, iii, 46–62, 75–92 belongs to the time of the first triumvirate and Cleopatra or to the time of Galba, Otho, and Vitellius; in the latter case the widow is Rome, and the holy ruler may be none else than the immortal God and great king mentioned in the same connection. The Book of Wisdom contains no allusion to the Messiah. Philo declares that the Israelites shall return to Palestine "led by a divine or more than human apparition" (*De Execrationibus*, iii, 437), and that if the future kingdom of peace shall be disturbed a man will come, according to the promise, to subdue the nations, God granting to the pious auxiliaries in psychic power and physical strength (*De Prœmiis et Pœnis*, ii, 421–428). But he seems to have thought of the divine glory and of deliverance through manly qualities rather than through a man. The Slavonic Enoch knows nothing of a Messiah. The same silence concerning this figure is found in such Palestinian works as Ecclesiastes; the *Assumption of Moses* (i–vi), written in the beginning of our era; the *Book of Jubilees;* and the original *Testaments of the Twelve Patriarchs*. It is held by many that, aside from the *Psalter of Solomon* there is no unmistakable reference to the Messiah in any literary production that can be dated with certainty as earlier than the time of Jesus. But the description given in this work (xvii, xviii) of the coming king shows with sufficient clearness that some men in Israel in the first century B.C. looked forward to the appearance of a descendant of David, who would be a conqueror of nations and a righteous ruler and whom they called the Messiah. And the recent discovery of the Zadokite work (see ZADOKITES) has shown that the term was applied in the second century B.C. to the expected high-priestly ruler, the Messiah from Aaron and Israel. According to Matt. xxii. 15, 16 (Mark xii. 13) there was a party of the Herodians. Tertullian declares that "the Herodians said Herod was the Christ." (*Præscr.* 45.) It is not improbable that the King who built the most splendid temple Jerusalem had ever had and restored the Davidic kingdom, even though it was by the favor of Rome, was thus looked upon as the promised Messiah by his courtiers. Judah of Gamala in Galilee seems to have been regarded as the Messiah by many and undertook an insurrection in 7 A.D. (See JUDAS OF GALILEE.) He was supported by Zadok, a disciple of Shammai. The immediate cause of the rebellion was the census of Quirinius on the accession of Archelaus. He was put to death, but his followers continued as a sect. (Josephus, *Wars*, ii, 118.)

Jesus of Nazareth was crucified under Pontius Pilate as a political criminal claiming, in defiance of the authority of Rome, to be King of the Jews. It is believed by some that he never claimed himself to be the Messiah. The Synoptic Evangelists believed, indeed, that he was the Messiah. But this belief may have been based on the conviction that he had been raised from the dead. For a time, at any rate, he avoided assuming any distinctive Messianic title, and on several occasions forbade his disciples to say that he was the Messiah. From their point of view they could explain this attitude only as a persistent attempt to keep his Messiahship a secret. This secret was known to God, who might in due time reveal it, and to the demons, who were punished for prematurely announcing it, but not to men. The disciples seem, however, to have regarded the term Son of Man as a self-designation of Jesus by which he intended to hint at his Messianic claims without directly disclosing them. But this belief, it is argued, may have been erroneous, and so indefinite a term as "man" cannot very well have been a Messianic title and is not found in Jewish literature as such. The life and teaching of Jesus offended all influential parties in the nation, while the enthusiasm and indiscretion of his disciples readily furnished immediate excuse for a false accusation. Pilate could scarcely avoid regarding him as a disturber of the peace and handed him over to be crucified on the ground of the loose charge preferred against him. Similarly, there is no evidence that John the Baptist regarded himself as the Messiah, though his disciples at a later time may have considered him as such.

According to the traditional view, still held by many Catholic and Protestant scholars, the Messianic belief was embedded in Hebrew history and interwoven with the deepest life of the people. The promises which formed and fed it are thought to reach back to the earliest Jewish annals, and the belief itself is regarded as resting upon traditions coeval with the origin of the human race. The Messianic idea is supposed to have been inseparably connected with the provision for the redemption of man after the fall and gradually unfolded through the history of the chosen people.

From this standpoint the evolution of the Messianic idea is traced through four distinct epochs, three within the limits of the Hebrew canon and the fourth outside it. The first of these ends with Moses. In the protevangelium there is the primal promise. The seed of the woman is to bruise the serpent's head. This promise takes shape in the family of Abraham, in whose seed all the nations of the earth are to be blessed. Paul argues in Gal. iii. 16 that the seed is a personal Messiah. His characteristics are gradually unfolded in the Shiloh of the dying Jacob (Gen. xlix. 10), in the star of Balaam (Num. xxiv. 17), and the prophet of Moses (Deut. xviii. 18, 19), as the lawgiver, teacher, and deliverer of Israel. The second period centres in the reigns of David and Solomon. The promise of a kingdom to David and his house forever is regarded as precluding a mere continuation of his dynasty on an earthly throne, but implying a superhuman royalty of which there is supposed to be a series of pictures in the Messianic psalms, which are believed to be pervaded with the expectation of a coming deliverer. In Ps. ii, xlv, lxxii, and cx, e.g., this traditional interpretation sees a picture not only of the Messiah's inheritance and the blessings and extent of his kingdom, but of the King himself reigning among men and bringing to his subjects righteous judgment, salvation, and redemption. He is both priest and king. He is David's Lord

as well as his son. His empire is spiritual. Its rule is world-wide and time-embracing. He is to reign until his enemies become his footstool. The third period extends to the close of the Hebrew canon and includes, according to tradition, the richest mine of Messianic prophecy in the Old Testament. Messiah as the servant of God is regarded as the central figure of Isaiah's prophecies. This expected king, this root of Jesse, will "stand for an ensign of the people." He will be the rallying point of the world's hopes, the true centre of its government. (Isa. xi. 10.) He is portrayed as the mighty God, the everlasting Father, the Prince of Peace. (Isa. ix.) The picture of the suffering servant of Yahwe in the fifty-third chapter is considered as a prophetic anticipation of the events in the judgment hall of Caiaphas and before Pilate's bar. Jeremiah is supposed to have depicted the future deliverer as a king executing judgment and justice in the earth (Jer. xxiii. 5) and Zechariah is thought to have painted him as an enthroned priest (Zech. vi. 13). Daniel vii, according to this view, applies to the coming Messiah the title Son of Man, whose dominion is "an everlasting dominion which shall not pass away." Finally Malachi is held to have referred to him as the angel of the covenant, whom Israel was seeking and who would "suddenly come to his temple." (Mal. iii. 1.) The fourth epoch extends from the close of the Hebrew canon to the beginning of the Gospel era. Among the Jews of Alexandria the Messianic hope at this time is supposed to have deteriorated, while among the Palestinian Jews it survived and flourished. The Hellenized peoples would naturally be absorbed in the current speculations regarding the Sophia and the Logos and long absence from Palestine, and a hesitancy to avow startling beliefs among unfriendly critics, would tend to quench all interest in the future of Jewish nationality. Nevertheless the expectation of a Messiah existed both among the common people and in more intellectual circles at the beginning of the Christian era. The Galilean peasantry and the Pharisees alike expected the fulfillment of the national hopes. An oppressed and suffering people naturally looked for a secular prince who would free them from the heathen yoke, and when Jesus entered upon his public ministry, Messiahship meant to the masses and the classes of Jewry simply emancipation from Roman rule. But Jesus did not lend himself to this type of Messiahship. He is supposed to have claimed to be the divine Messiah of David and Isaiah. The conversation between him and Peter at Cæsarea Philippi is understood as implying on his part an acceptance of the Messianic title, and Peter's confession is taken as the supernaturally imparted recognition of Jesus as the Messiah. In the Fourth Gospel the same designation of him is used by the Samaritan woman (John iv. 25, 26) and accepted by Jesus, and Andrew says to his brother Simon: "We have found the Messiah, which is, being interpreted, the Christ" (John i. 41 et seq.).

According to the traditional view, the title Son of Man was the Christ's self-chosen designation of himself. To Jewish ears it is supposed to have been a clear assertion of Messiahship. Some think that in consequence of the prophecy of Daniel it became a popular and official title of the Messiah. In one part of the Book of Enoch (q.v.), which, however, is of uncertain date, the judgment day of Messiah, identified with Daniel's son of man, stands in the forefront of the eschatological picture. Jesus, when standing at the tribunal of Caiaphas, is reported as having said to his judges: "Hereafter shall ye see the Son of Man sitting at the right hand of power and coming in the clouds of heaven" (Matt. xxvi. 64), and a similar prediction is found in his prophecy over Jerusalem (Matt. xxiv. 30). Those who accept the genuineness of these sayings think that it was no merely generic title, but the constant setting forth of his Messianic claims, and that it brought down upon him the wrath of the scribes and Pharisees. The Sanhedrin, the highest court of Jewry, is supposed to have condemned him because he claimed divinity. "We have a law and by our law he ought to die because he made himself the Son of God," said the members of this court to the Roman governor, according to John xix. 7. "He hath spoken blasphemy," cried the high priest, according to Matt. xxvi. 65.

It should also be stated that between the critical estimate first given and the traditional interpretation just outlined many scholars have assumed a mediating position, rejecting the bulk of supposed Messianic prophecy and the accuracy of the New Testament interpretation of it, while still maintaining that Jesus regarded himself as the Messiah and gave to the Messiahship as to the kingdom a more spiritual significance.

In 37 A.D. a Samaritan appeared as a leader of a rebellion in Tirathana. Precisely what claims he made for himself is not clear from the account of Josephus (*Ant.*, xviii, 85 et seq.). There are many indications that after this time a more transcendental character was given to the Messianic conception, not only among the Jews who looked forward to a return of Jesus as the Messiah, but also in other circles of Jewry. Theudas, who announced himself as the Messiah in the reign of Claudius, did not depend upon military strength or political diplomacy, but looked for a miraculous establishment by God of the Kingdom of Israel in place of the Roman Empire. He was beheaded by Cuspius Fadus in 46 A.D. (Josephus, *Ant.*, xx, 97 et seq.) The Egyptian (c.58 A.D.) mentioned by Josephus (*Ant.*, xx, 169 et seq.) probably claimed to be only what the historian calls him—a prophet. But Menahem, son of Judah, the Galilean, who appeared during the siege of Jerusalem, led the attack upon the Roman garrison clothed in royal garments and fell a victim of his Messianic pride and arbitrariness. An apocalyptic fragment of Jewish origin, preserved in Rev. xi. 1, 2, xii, sets forth figuratively how the Messiah has already been born, but is hidden secure against Roman persecution, to appear in due time. This idea that the Messiah has been born in the Jewish community, but has already as a child been translated, is similar to the conception found in the Babylonian Talmud (*Sanhedrin*, 98 b), where the Messiah is a deceased descendant of David who rises from the dead to accomplish the delivery of Israel. Both of these notions were due to the conviction that God would provide a genuine son of David. A translated hero would naturally return on the clouds of heaven. Thus, in the *Apocalypse of Baruch*, written after the fall of Jerusalem, the Messiah is "revealed" (xxix, 3, xxxix, 7) and "returns in glory" (xxx, 1) to rule until the world of corruption is at an end (xl, 3), sparing some and putting others to death (lxxii, 2–6). In the *Apocalypse of Ezra*, written c.97 A.D., the Mes-

siah is to be revealed during 400 years and then die together with all men, whereupon the present age will end and a new world begin, after seven days of silence, with the resurrection of the dead and the appearance of the Most High on the judgment seat (vii, 28 et seq.). The woman that brings forth a child, as in Rev. xii, loses him when she is about to give him a wife and flees into the wilderness (ix, 43 et seq.). The lion rebuking the eagle is said to be the Messiah, who has been preserved for the end from the seed of David (xii, 3 et seq.). Finally the manlike or angelic being that rises from the sea and flies with the clouds of heaven, destroying an army with the fire proceeding from his mouth, is declared to be the Messiah (xiii). In spite of the marked influence of Jewish-Christian thought, the emphasis is strongly put upon the assertion that God is not to judge His creation through any one (v, 56, vi, 6). It is possible, however, that even this step was taken by the Jewish interpolator of the parables of Enoch. (See ENOCH, *Books of.*) In the original vision God alone is the judge and there is no Messiah; but the book seems to have been annotated and expanded by a writer who looked forward to the revelation of a chosen instrument, not merely for the punishment of the nations, but for the judgment of the world—a man destined to sit upon a glorious throne to judge angels and men (xlv, 3, 4, xlv, li, liii, 6, lv, 4, lxi, 8, 9). This picture has finally been retouched by a Christian hand. The Aramaic original is lost, but even the Ethiopic translation renders it possible to distinguish between the early passages, where a *bar nasha* in the generic sense of man occurred, and the places where the Christian title has been subsequently introduced. The original work may have been written in the time of Caligula, and the Jewish expansion in the reign of Domitian. After this a reaction against the transcendental Messianic idea set in. This was developed in Christianity as it separated itself from Judaism. The Messianic idea became fused with metaphysical speculation of Greek origin to such an extent that ὁ χριστός, "the anointed one," the etymological equivalent of "the Messiah," finally conveyed a meaning absolutely foreign to the original conception.

The figure of Simon bar Kozeba (or Bar-Cochba) was probably as close a realization of the popular Jewish ideal of a Messiah as history ever produced. Of him alone can it be said that he was not only recognized by his people as the Messiah at a time when the Messianic idea had reached its full development and regarded himself as such, but also succeeded temporarily in redeeming Jerusalem from foreign oppression. In less than a year he conquered 50 fortified cities and 945 towns and villages. His army consisted of 200,000 men. For two years and a half he reigned as King. Only after 52 battles could Julius Severus vanquish him in 135 A.D. There is something sublime in this King of Zion bidding Imperial Rome defiance. The terrible persecutions that followed the Hadrianic insurrection did not quench the Messianic hope. This is shown by the "Eighteen Prayers"; by Trypho, who told Justin Martyr that all Jews believed the Messiah would come, a man born of men; and by Celsus, who in 178 A.D. no doubt correctly represented his Jew as cherishing this expectation. The Targums also indicate its continuance. The idea of a Messiah ben Joseph who is to rule until Messiah ben David comes may be an early Jewish concession to the Ebionitish Christians who believed that Jesus was the son of Joseph; or it may be another form of the belief, already met with in the Documents of the Damascus Covenanters, that the Messiah would come from Israel and not from Judah. Only in late writings is there any reference to a suffering Messiah, though the notion of sufferings of Israel previous to the establishment of the Messianic kingdom is common. The end of the Roman Empire and the victories of the Mohammedans naturally stirred afresh the hope of a return to Palestine and the coming of the Messiah. In 716–721 Serenus, a Galilean, appeared as a Messianic reformer, after the fashion of Mohammed, rejecting certain rabbinic regulations as to food and marriage and gaining many followers. But when he was brought to task by Yazid II, the Ommiad Caliph, he lacked the courage of his convictions and was handed over to the Jewish authorities for punishment. From 745 to 755 Abu Isa exercised a great influence as a reformer, abolishing the law of divorce and the sacrificial cult and maintaining himself with a large army against Merwan II and Abdallah. After his death he had followers into the tenth century. Yudghan, of Hamadan, on the other hand, pursued no political ends. He sought only to reform Judaism, being an ascetic and a believer in the transmigration of souls and the allegorical interpretation of the Bible. He died c.800 A.D., though his followers believed him to be still living and destined to return in the appointed time. In 1160 David Alrui, of Amadia, Persia, proclaimed himself to be the Messiah in Azerbaijan. His plan was to use the weakness of the Abbaside caliphate for the establishment of a free Jewish state, and he attracted to himself large masses of Jews; but he was murdered by his father-in-law before he could carry out his vast enterprise. A Messianic cult community, the Menahemites, cherished long his memory and ideal. Abraham ben Samuel Abulafia, of Saragossa, announced himself as the Messiah in 1280. He was a mystic and occupied himself much with cabbalistic speculations. The expulsion of the Jews from Spain drove many earnest minds to the prophetic writings. Even such a statesman as Isaac Abarbanel wrote works in which he announced that 1503 would be the year of redemption. In the sixteenth century David Reubeni and Solomon Molko appeared in the rôle of the Messiah. The former pretended to be the brother of a prince reigning in Arabia and was received with great honor by Pope Clement VII. The latter, born in 1500, was a Christian who became a convert to Judaism and seems to have sincerely believed in his mission. He is said to have prophesied accurately the inundation of Rome in 1530 and the earthquake in Portugal in 1531, and thereby gained a great reputation. He was saved from death in Rome by Clement VII substituting another man for him, but suffered martyrdom courageously in 1532. His followers long believed that he had escaped death this time also. The most important Messiah after Solomon Molko was Sabbathai Zewi (1626–76). He was born in Smyrna and belonged to a family of Spanish Jews. His brother was the agent in Smyrna of an English mercantile house, and through him Sabbathai became acquainted with the speculations of Christian Pietists who expected the second advent of Christ in 1666. He was an eager student of cabbalistic works. His personality was very attractive, and in all lands Jews were drawn to him and ac-

cepted him as their heaven-sent leader. The enthusiasm was boundless, and the hope of a return to Palestine filled thousands of hearts. Sabbathai intended to abrogate the law, establish a new code based on the Cabbala, introduce the doctrine of a Trinity consisting of three persons —the Ancient of Days, the Messiah, and the female Shechinah. In the year 1666, however, he was ordered to appear before the Turkish authorities at Constantinople. Here he finally abandoned the Jewish faith and became a Moslem. The disenchantment was great, but a sect of Sabbatians continued to honor him as the Messiah. It is obvious that the Messiahs of Judaism have sometimes been mystics, obeying what seemed to them a divine call, sometimes political leaders taking up a heroic struggle for liberty, sometimes men of personal ambition and unscrupulous methods. But Jews, Christians, and Mohammedans owe much moral vigor and spiritual uplift to the Messianic hope.

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MESSIAH, The. 1. A poem by Alexander Pope, which appeared in the *Spectator*, May 14, 1712. It is a sacred eclogue, imitating Vergil's *Pollio*. 2. An epic poem by Klopstock (q.v.). 3. An oratorio by Handel, composed in 1741 and given first in Dublin, April 13, 1742, in aid of charity, and in the United States (for the first time in its entirety) Dec. 25, 1818 (Boston).

MESSIDOR, mĕs′sē′dôr′ (Fr., from Lat., *messis*, harvest + Gk. δῶρον, *dōron*, gift). The tenth month of the French Revolutionary Calendar, beginning on June 19 in years 1 to 7, and on June 20 in years 8 to 13.

MESSINA, mĕs-sē′ná (anciently *Messana*). The capital of the Province of Messina, Sicily. It is in the northeast corner of the island, on the Strait of Messina, 59 miles by rail northeast of Catania (Map: Italy, E 5). It is situated between a sickle-shaped harbor on the east and a chain of abrupt conical peaks on the west, rising to a height of 3700 feet. The climate is very even. The mean temperature is 66° F. The city suffered practically complete destruction on Dec. 28, 1908, by an earthquake, which, measured by destruction of life and property, was the severest ever recorded. Prior to that time Messina was, after Palermo, the most important city of Sicily. Messina was substantially built and had some fine lava-paved thoroughfares, affording views of the bay and of Calabria across the strait. The city itself had no very famous attractions for sightseers, having retained few of its striking antiquities, owing to a rather calamitous career; for prior to 1908, notably in 1783, it had suffered especially from earthquakes. The most interesting structure was the cathedral, dating from Norman times, having been begun in 1098 and finished by Roger II. It was a mixture of different architectural periods, and little of the original edifice remained to the building destroyed in 1908.

Among the leading secular edifices were the municipal palace, completed in 1829, and the villa Rocca Guelfonia, with Norman remains. The museum in the convent of San Gregorio contained a few paintings, some marbles and other antiquities, and a collection of majolica vases. The manufacturing interests were not extensive. The chief products were hardware, silk, muslin, and linen, and Messina had some fame for satins and damasks. The commerce was large and was facilitated by the excellent harbor, to which the importance of the city was chiefly due. Since the earthquake of 1908 the city has been reoccupied, and its rebuilding is in progress. The harbor is still busy with traffic in silk, oil, wine, oranges, lemons, fruit essences, coral, etc. Messina ranked seventh in 1911 among Italian ports in respect of the total tonnage entered and cleared (5402 vessels, of 4,166,367 tons net). There is direct steamship communication with Naples and Marseilles. The university, opened in 1538, had an enrollment of 574 students in 1907–08 and 238 in 1911–12. Messina is the seat of an archbishop. Pop. (commune), 1881, 126,497; 1901, 149,778; 1905, 158,812; 1911, 126,557.

The outskirts and environs are delightful, affording magnificent views of the sea as well as of Mount Etna. On the west rises the former fort of Castellaccio, and not far away to the south is Fort Gonzaga, on an historic spot. The new Campo Santo, before the earthquake, was beautiful, with its graceful Greek colonnades and wonderful views. The Telegrafo—the summit of a pass near Messina—is much visited for its scenery. Here was supposed to be the Charybdis of the familiar legend, opposite Scylla, on the Calabrian coast.

History. Messina is a town of great antiquity, its foundation being ascribed to pirates from Cumæ in the eighth century B.C., when it was known as Zancle (a sickle), in allusion to the shape of its harbor. At the end of the fifth

century B.C. the town was occupied by fugitives from Samos and Miletus, and it soon after passed to Anaxilas, the tyrant of Rhegium, who introduced there Messenians from the Peloponnesus, by whom the name of the city was changed to Messana. After the death of Anaxilas, Messana became a republic and maintained that status until its destruction by the Carthaginians during their wars with Dionysius of Syracuse at the beginning of the fourth century B.C. It was rebuilt by Dionysius, but soon fell again into the hands of the Carthaginians, who were finally expelled by Timoleon in 343 B.C. During the war between Agathocles (q.v.) of Syracuse and Carthage, Messana sided with the Carthaginians. After the death of Agathocles the town passed into the hands of the Mamertines (q.v.), whose appeal to Rome brought on the First Punic War. This war left Messana in the possession of Rome, and the town subsequently attained considerable commercial importance. It later gained Roman citizenship, perhaps from Julius Cæsar; Augustus established a colony there. In 831 A.D. the town was taken by the Saracens, and in 1061 was conquered by the Normans. In 1194 it became a part of the dominions of Henry VI (q.v.) of the German Empire, and had the same history as Sicily (q.v.) until 1282, when it passed to the Spaniard Peter I. Except for a few years it remained under Spanish rule till 1713. The town became a flourishing seat of trade in the Middle Ages and later received important privileges from Charles I of Spain, which added greatly to its prosperity. During the struggle between the aristocratic faction, or Merli, and the democratic faction, or Mavizzi (c.1672–78), the Senate appealed for aid to the French, who occupied the city, but soon abandoned it, after having defeated the combined fleet of Spain and Holland. Left in the hands of the Spaniards, the city was deprived of its political liberties, and soon lost its commercial importance. The plague of 1743 and the earthquake of 1783 carried off a considerable part of its population. On Dec. 28, 1908, the city was demolished by an earthquake, and about 96,000 persons were killed.

MESSINA, ANTONELLO DA. See ANTONELLO DA MESSINA.

MESSINA, STRAIT OF (It. *Faro di Messina*, Lat. *Mamertinum Fretum*). The channel separating Sicily from the southern point of Italy and connecting the Ionian with the Tyrrhenian Sea (Map: Italy, E 5). It is 24 miles in length and from 2 to 12 miles in breadth. Regular tidal currents run through the strait, which is of great depth, in some places exceeding 4000 feet. See SCYLLA AND CHARYBDIS.

MESS'MATES, ANIMAL. See COMMENSALISM.

MESS'MER, SEBASTIAN GEBHARD (1847–). An American Roman Catholic archbishop, born at Goldach, Switzerland. He was educated in St. George College at St. Gall, Switzerland (1861–66), and at the University of Innsbruck in Austria (1866–71). Ordained a priest in 1871, he was thenceforth until 1889 professor of theology at Seton Hall College, South Orange, N. J., and in 1890–92 was professor of canon law at the Catholic University of America, Washington, D. C. He was consecrated Bishop of Green Bay (Wis.) in 1892 and was appointed Archbishop of Milwaukee (Wis.) in 1903. He edited Devivier's *Christian Apologetics* (1903) and Bishop England's *Works* (7 vols., 1908) and is author of *Praxis Synodalis* (1883); *Canonical Procedure* (1886); *Spirago's Method* (1901); *Outlines of Bible Knowledge* (1910).

MESSUAGE, měs'wăj (OF. *masage*, a tenement, from *mas*, a house, manse). A legal term employed in conveyancing as substantially equivalent to the phrase "dwelling house and appurtenances," and most commonly construed as meaning the curtilage, courtyard, orchard, if there is one, etc. See APPURTENANCE; CURTILAGE.

MESSYS, or METSYS, QUINTEN. See MATSYS, QUINTEN.

MESTCHERSKY, měst-shĕr'skê, PRINCE VLADIMIR PETROVITCH (1845–1914). A Russian writer and editor. He became an intimate friend of both Alexander III and Nicholas II. In 1878 he founded and thereafter edited the *Grashdanin*, considered by some the most reactionary paper in Russia. He published some 12 novels, in which he portrayed the social conditions in St. Petersburg in a realistic and often coarse manner. His books include: *Women of St. Petersburg*, *The Nihilists*, and *Men of the Great World*. Mestchersky was sentenced to one week in prison in 1914 for publishing information regarding a mutiny in the Russian navy. Russians nicknamed him "the Knower" because of his intimate knowledge of court and cabinet matters. Throughout his life he fought strenuously every reform and progressive movement.

MESTIZO, mĕs-tē'zô (Sp., mongrel, from Lat. *mixtus*, p.p. of *miscere*, to mix). The ordinary term in use in Spanish-American countries to denote the offspring of white and Indian parentage, and usually understood to mean the offspring of a white father by an Indian mother. The equivalent term in French Canada is *metis* and in the United States half-breed. The offspring of an Indian and a *mestizo* is called *mestizo-claro*, of a negro and mestizo a *mulato-oscuro*, of a mulatto and mestizo a *chino*.

MES'TOME (from Gk. *μέστωμα*, *mestōma*, fullness, from *μεστός*, *mestos*, full). In botany the conducting portion (hadrome and leptome) of a vascular bundle, which means the tracheary vessels of the xylem and the sieve vessels of the phloem.

MESTRE, mĕs'trâ. A town in the Province of Venice, north Italy, 5 miles by rail northwest of the city of Venice, on the border of a lagoon (Map: Italy, D 2). The town has a sixteenth-century palace and a fourteenth-century clock tower. There is a considerable transit trade; also manufactures of machinery, silk goods, and bricks. Pop. (commune), 1901, 11,680; 1911, 17,306, including Malghera.

MESTU'RUS (Neo-Lat., from Gk. *μεστός*, *mestos*, full + *οὐρά*, *oura*, tail). A fossil actinopterygian fish of the family Pycnodontidæ, found in the Jurassic rocks of Europe. The body was flat and high and was covered with rhombic ganoid scales that are most peculiar in being united to each other by jagged sutures. The mouth is small and provided with powerful grinding teeth on the palate and sharp cutting teeth in the jaws. See GANOIDEI.

MESVINIAN. See PALEOLITHIC PERIOD.

MÉSZÁROS, mā'sä-rŏsh, LÁZÁR (1796–1858). A Hungarian patriot. He was born at Baja, studied theology and law, and in 1813 joined the Hungarian army in the campaign against Napoleon. He was colonel of a Hussar regiment in 1848, when Batthyányi called him to be Minister of War in his cabinet. In the same

year Mészáros took command of an expedition against the Rascians in his native county of Báes. This proved a complete failure, and in January, 1849, his army was defeated with great loss before Kaschau. For a brief time he was nominally commander in chief of the Hungarian forces and shared with Dembinski in the defeats at Szöreg and Temesvár. He then fled to Turkey. After residing for some years in England and France, Mészáros emigrated to the United States. He died at Eywood, Herefordshire, England, on his way to Switzerland.

META, mā'tá. One of the principal tributaries of the Orinoco. It rises in the Eastern Cordillera of the Colombian Andes, near Bogotá, and flows in a northeasterly direction to its junction with the Orinoco, on the boundary between Colombia and Venezuela (Map: Colombia, C 2). Its length is about 700 miles, for the greater part of which it is navigable for small steamers, though its channel is filled with numerous islands.

METABETCHOUAN, mĕt'á-bĕt-chōō-ăn'. The principal southern affluent of St. John Lake (q.v.), Canada (Map: Quebec, G 2). It is 90 miles long and near its mouth occur its fine falls, 236 feet high.

METAB'OLISM (from Gk. *μεταβολή, metabolē*, change, from *μεταβάλλειν, metaballein*, to change, from *μετά, meta*, beyond + *βάλλειν, ballein*, to throw). The total changes occurring within the plant or animal body in foods, inorganic nutrients, and even living substance during the life of the organism. The construction of more complex materials from simpler ones is spoken of as anabolism, and the breaking down of the complex substances to simpler ones as katabolism. It was once thought that the metabolic activity of an organism consisted mainly or exclusively in building complex labile living substance, followed by the decomposition of this substance. This conception really led to the use of the terms "anabolism" and "katabolism." It seems evident now that many synthetic and analytic processes occur in the organism without the protoplasm at the same time passing through corresponding changes. The function of the protoplasm in many of these changes is apparently that of the production and control of enzymes involved in the processes. There is much evidence for the extreme lability of living matter and of some of the compounds entering into it, so that it is not unlikely that synthetic and analytic changes are occurring in it also with various changes of conditions.

In plant physiology the term "metabolism" is used in essentially the same sense as in animal physiology. The first step in the anabolism of green plants is photosynthesis. The carbohydrates first formed are probably hexoses. These are in part condensed directly or by the intermediate formation of pentoses into the storage or frame-building carbohydrates—starch, inulins, cellulose, hemicellulose, and wood structures. The rest of the carbohydrates form the carbon source for the construction of a great variety of organic compounds of the cells, the more important of which are fats, lipoids, amino acids, amines and alkaloids, glucosides, and proteins. In the synthesis of fats the sugar is first transformed to glycerine and fatty acids, and these condensed into the fats. Lecithin is a lipoid always present in the living cell. It is really a fat in which one molecule of fatty acid is substituted by phosphoric acid bearing a nitrogen-containing radical, cholin. The synthesis of lecithin is a very complex process and seems to run parallel with that of amino acids. Amines and alkaloids, both nitrogen-containing compounds, seem to have their origin in amino acids. The proteins are synthesized by two general steps. The various amino acids entering into the proteins are first formed. These are then condensed into proteins. Several of these compounds bear nitrogen, phosphorus, or sulphur in addition to the elements found in carbohydrates. These elements are derived from the salts of nitric, phosphoric, and sulphuric acids. The step of perhaps greatest interest in anabolism or assimilation is the formation of protoplasm itself from various of these substances. Of this we know nothing except that living protoplasm always contains proteins, fats, lipoids, and carbohydrates, the first in very high percentage. Just how these substances are united or arranged to constitute living matter we do not know, for the act of analysis itself leads to their separation and rearrangement. In the formation of nonliving structures like cell walls and starch grains enzymes such as cytocoagulase and amylocoagulase seem to play a main rôle. It is possible that in the synthesis of protoplasm itself such condensing enzymes are active; if so, their great lability prevents their isolation and study.

There are autotrophs that synthesize their organic materials from carbon dioxide and water by means of chemical energy (chemosynthesis in contrast to photosynthesis), or energy gained from oxidizing simple substances like hydrogen sulphid, ammonia, hydrogen, methane, and carbon monoxide. We know almost nothing of the details of their assimilative processes, but they are likely similar in general outline to assimilation in green plants.

In heterotrophs either the carbon source or both the carbon and nitrogen sources must be organic substances such as sugar, alcohol, organic acids, amino acids, peptones, or even in same cases proteins. While the anabolic processes are in general reduction or endothermic processes, the katabolic changes involve in large part oxidation or exothermic changes. It must be mentioned, however, that purely condensative and digestive processes (condensation of glucose to starch, or amino acids to proteins, or the reverse digestions) are almost nil in energy consumption and production. The main katabolic processes of the plant are digestion, respiration, and fermentation, which are fully treated under these terms.

Metabolism, in Medicine. In medicine under metabolism are understood the process of, and the chemical and tissue changes produced in, the human body by the assimilation of food. Metabolism considers therefore not only the action of the living cell upon a substance and the change produced in the substance as well as in the cell, but also the change in the tissue of the body to which the cell belongs, i.e., the nutrition of the body. There are two kinds of metabolism: (1) *anabolism*, the constructive and assimilative changes by which matter becomes protoplasm (a substance of the lower order changed into one of the higher); (2) *katabolism*, the destructive or retrograde change by which protoplasm becomes finally waste product (a substance of the higher order changed into one of the lower).

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F. G. Benedict, *Influence of Inanition on Metabolism* (Washington, 1907); Jost, *Lectures in Plant Physiology* (Oxford, 1914).

For special discussions of metabolic processes, see ANIMAL HEAT; ASSIMILATION IN PLANTS; DIGESTION IN PLANTS; FERMENTATION; FOOD; NUTRITION; PHOTOSYNTHESIS; RESPIRATION IN PLANTS.

MET'ACEN'TRE (from Gk. μετά, *meta*, after + κέντρον, *kentron*, centre). It is shown in hydrostatics that a floating body is acted on by two equal forces in opposite directions—one vertically down through the centre of gravity of the body itself, the other vertically up through the centre of gravity of the volume which was occupied by the liquid now displaced by the body. If the body is at rest these two forces must lie in the same vertical line; but the question of the stability of this equilibrium depends upon what happens when the floating body is tipped slightly. If the forces bring it back to its former position the equilibrium is stable; if they make it tip still farther the equilibrium is unstable. Imagine a line drawn in the floating body so as to pass through the centres of gravity of the body and of the displaced liquid when the body is in equilibrium; this line is called the axis. Now imagine the body tipped slightly, thus making the axis inclined to the vertical; the line of action of the vertical upward force will intersect this line at a point called the metacentre. If the metacentre lies above the centre of gravity of the body the two forces will form a couple tending to restore the body to its former position, where the equilibrium was stable. If, on the other hand, the metacentre is below the centre of gravity of the body the forces form a couple tending to tip the body farther, and so the equilibrium was unstable. An elongated floating body like a ship has a *transverse* metacentre and a *longitudinal* metacentre. The former is the one most commonly considered. The metacentric height is the vertical distance between the centre of gravity and the metacentre. It is evident that this must always be a positive quantity; for if the centre of gravity were above the metacentre there would be no force tending to keep the vessel upright and it would capsize. See SHIPBUILDING.

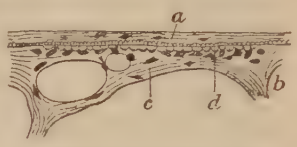
MET'ACHRO'SIS (from Gk. μεταχρωννύναι, *metachrōnnynai*, to change color, from μετά, *meta*, after + χρωννύναι, *chrōnnynai*, χρώζειν, *chrōzein*, to color, from χρῶσις, *chrōsis*, color,

CHROMATOPHORES OF A FROG.

a, wholly contracted; *b*, *c*, half relaxed; *d*, wholly relaxed; *e*, wholly contracted (a capillary vessel); *f*, *g*, *h*, expanded color cells.

from χροιά, *chroia*, χρόα, *chroa*, skin, color). Color change, as that of the chameleon, in adaptation to surroundings, due to changes in the size of the pigment cells of the inner layer of the skin. These specialized pigment cells are called chromatophores, and the remarkable changes in the color of the skin of the chameleon, of the tree toad, the squid, etc., depend on the distribution of these pigment cells, which dilate (becoming highly ramified) and contract under certain kinds of irritation. The pigment (q.v.) varies in color in different species and in different parts of the body, being black, brown, yellow, and sometimes even red or green. In the goby Heincke found that the chromatophores which are yellow or greenish yellow when distended become orange colored when contracted, while the orange or red ones when shrunk become brown or even black; and he detected in the goby a special kind of chromatophores which were filled with iridescent crystals of marvelous delicacy, appearing when dilated as specks of metallic sheen.

These changes may be due to the direct influence of the stimulus of light, or indirectly through the eyesight. Semper says that Lister demonstrated as long ago as 1858 that the activity of the chromatophores depends solely on the healthy condition of the eye. As soon as the eyes are destroyed or the optic nerve is divided the chromatophores do not function. He was confirmed in this view by Pouchet's experiments on fishes and crabs, showing that the chromatophores lost their power of contraction if the two sympathetic nerves were destroyed at the root.



SECTION OF A FROG'S SKIN.

a, epidermis; *b*, cutis, with black, star-shaped, deep-seated cells; *c*, *d*, yellow pigment cells in a thick, single layer close under the epidermis.

Heincke's observations in some respects contradict those of Pouchet. Biedemann (1892), on the other hand, has claimed that the color cells change their shape owing to the direct action of the light and of temperature. He shows that the slightest change of temperature affects the mutual disposition of the pigment cells, and consequently the color, of the frog. It is enough to keep the animal in the hand to provoke a contraction of its black cells. The amount of blood supply also has a definite effect. Steinach also (1891) has proved that light acts as a direct stimulus. Biedemann therefore appears to have proved that the chief agency of changes of color is not in the sensations derived from the eyes, but in those derived from the skin. On the other hand, recent interesting experiments by Sumner seem to show that the color changes adapting the pattern of flounders to artificially patterned bottoms are due to stimuli received solely through the eyes.

It is well known that the underside of flatfish is white or colorless. This is due to absence there of pigment cells. These, however, are present in very young flounders, but as they grow unsymmetrical the fish turns the left side upward, and the chromatophores disappear from the right or under side. Cunningham experimented with young flounders by placing a mirror below the aquarium at an angle of 45° and cut off the light from above. In the larger number of specimens thus treated, after several months, more or less of the skin of the lower side was pigmented. He thus proved that the absence of

pigment on that side in the normal fish is due to its position in shadow. It thus appears that the absence of the pigment or of color is due to the absence of light—a mechanical or physical cause.

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MET'AGEN'ESIS. See ALTERNATION OF GENERATIONS; PARTHENOGENESIS.

MET'AKINE'SIS (Gk. *μετακίνησις*, transposition). A term in biology suggested by Jaekel to express the results of cenogenetic modification, since the process involves a thoroughgoing modification of a form in a way impossible in the adult and only possible in a larval or early stage, or in which the various organs are not yet specialized. Consult Jaekel, *Ueber verschiedene Wege phylogenetischer Entwickelung* (Jena, 1902; reviewed in *Science*, vol. xvii, New York, 1903). Compare PALINGENESIS.

METAL. See HERALDRY.

METAL, FUSIBLE. See FUSIBLE METAL.

METAL CASTING. See FOUNDING.

METAL'DEHYDE. See ALDEHYDE.

METAL LATH. See LATHS AND LATHWOOD.

METALLIC INK. See INK.

METALLIC PAINT. See PAINT, MINERAL.

MET'ALLOG'RAPHY. The study of the structure and constitution of metals and alloys and their relation to the physical properties. Sorby, who was the first to make rock sections, examined the structure of iron and steel for comparison with that of meteorites in 1863. Martens in 1878 took up the work. Osmond and Werth's "Structure cellulaire de l'acier fondu" (*Comptes Rendus*, vol. c, p. 450) and Wedding's paper on the microstructure of malleable iron appeared in 1885 (*Journal Iron and Steel Institute*, vol. i, p. 187). Since then metallography has grown until now it is a recognized method of testing and of research.

The Structure of Metals. The old idea of the structure of metals was based on an examination of fractures, and from this came the terms "crystalline," "granular," "fibrous," "amorphous," etc. The microscope has proved, however, that all metals are crystalline, that the appearance of the fracture may have no relation to the structure of the metal but depends not only on the method of breaking but also on the mechanical and thermal treatment the metal may have undergone. All metals which have cooled down from the liquid state are built up of crystalline grains with distinct orientation, the size and shape depending chiefly on the rate of solidification and the mass of the metal.

A section of a small ingot of pure zinc, after deeply etching with dilute nitric acid to bring out the grain structure, is shown on the accompanying plate. It shows the growth of crystals perpendicular to the cooling surface of the mold, also the central pipe or shrinkage cavity characteristic of most metals—for as most metals freeze they contract. When the metal is poured into the mold heat flows from the hot metal to the cold mold and a point is reached when the metal next the mold is at its freezing point. Crystals start to grow in all directions, but are soon restricted from growing laterally by adjacent crystals, which leaves only one direction in which they can grow, viz., towards the still liquid mass of metal, which is opposite to the direction of flow of heat, so that they grow perpendicularly to the isothermal lines of the metal. This method of growth is clearly shown at the bottom corners of the ingot in Fig. 1.

In a thin casting these crystals perpendicular to the surface of the mold soon meet at the centre and the fracture of such a metal would be columnar. In thicker castings, however, the process of freezing is slower, the thermal gradient between the centre and the outside becomes less and less, and a point is reached when the still liquid metal begins to crystallize at a number of independent centres. These crystals grow in all directions until they meet adjacent crystals, and in this way the centre of the metal is composed of equidimensional grains. Thus we get a difference in structure between the outside and the centre of the ingot or casting, the outside being columnar, the interior granular.

The method of growth of crystals is well shown by the skeleton crystals found in the interior of the pipe or shrinkage cavity of large castings. This is illustrated on the plate Fig. 2, a specimen of lead obtained by taking a crucible of molten metal, chilling the surface, and, when a crust of solid metal had formed, pouring out the still liquid interior. The crystals grow with definite axes, which are well shown on the surface of small ingots of most metals. Fig. 3, magnified 30 diameters, is the surface of a small ingot of the metal cadmium. It shows several skeleton crystals or dendrites. These form the framework of the grains and are left standing out in strong relief because they were the first to freeze, and as they froze the metal contracted until the whole mass was solid. A section, however, would show the metal to be built up of

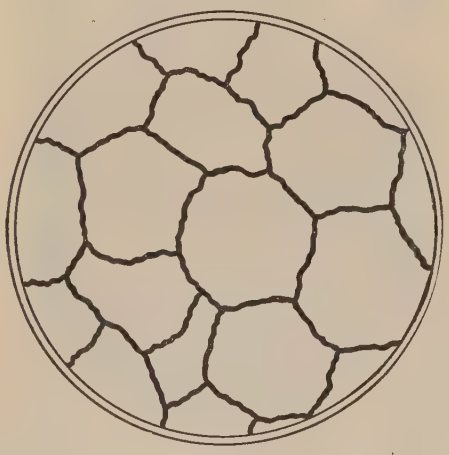

FIG. 15.

polygonal grains as in Figs. 5, 8, or 15. On deep etching each grain shows its own particular orientation, appearing light or dark according to the way it is cut, as seen in Fig. 1.

The structure of a metal shows no change when strained within the elastic limit, but when

once this is passed there is a permanent deformation. If a polished surface be examined after such straining, within the grains are seen a number of parallel lines and bands which change in direction as we pass from one grain to the next. As the strain increases these slip lines and slip bands increase in number and are found in more than one direction within each grain, and the grains themselves become elongated and drawn out as the strain becomes more severe. Figure 4, magnified 30 diameters, shows the slip bands produced in zinc. The orientation of the grains can be seen, while within the two largest grains the slip bands appear white and change in direction as we pass from one grain to the next. In some metals the grains appear capable of being elongated and drawn out indefinitely as, e.g., copper. Figure 5, magnified 200 diameters, shows the grain structure of pure copper. Figure 6, magnified 400 diameters, shows the structure of a cold-drawn copper rod, deeply etched, in which the grains are very much drawn out and show a crosshatched effect due to the slip lines. Some metals, like lead and tin, behave differently, for when the strain has been very severe, as in rolling, the grains are first distorted and then broken down and the structure becomes composed of a broken-up conglomerate. When a metal is strained by cold work, as in rolling or drawing, the elastic limit and tensile strength are greatly increased and the metal becomes much harder, but as a rule the ductility falls off proportionately.

On annealing such a strained metal recrystallization takes place and crystals or grains grow with distinct polygonal boundaries and generally show marked twinning (Fig. 16), the grain size

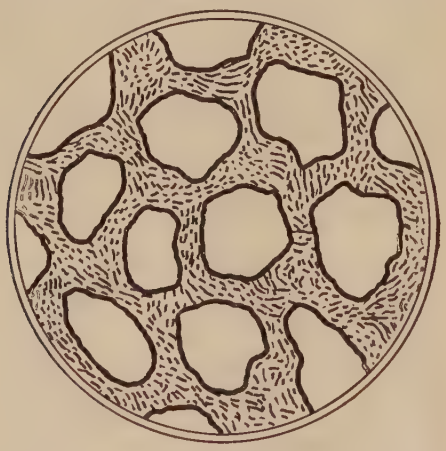

Fig. 16.

depending on the time and temperature of annealing, the amount of work the metal has undergone, and upon its cross section or mass. The strength falls off and the metal becomes comparatively soft and its ductility increases. Figure 7, magnified 400 diameters, shows the structure of a cold-drawn copper tube after annealing at a dull red heat. The original structure was the same as seen in Fig. 6. The deep etching reveals the twin structure more prominently than the grain structure. Both the twinning and the grain structure can be developed by annealing in hydrogen. Figure 8, magnified 400 diameters, shows this same cold-drawn copper, polished and then reheated to 1000° C. in an atmosphere of hydrogen. The polygonal grain boundaries show up distinctly, while the alternate light and dark bands show the twinning. The whole structure is in marked contrast with that of Fig. 6.

The recent researches of Beilby and others tend to confirm his theory that cold working of a metal produces an amorphous modification due to flow on the surfaces of the planes of slip, which modification is harder, stronger, and less ductile than the crystalline one. Reheating to temperatures around 300° C. causes the transformation from the amorphous to the crystalline state and restores the ductility.

The Constitution of Alloys. The constitution of binary alloys is shown by the thermal diagram, which in terms of temperature and composition shows the changes which occur when an alloy freezes and as it cools down in the solid state. Portevin and Bornemann have collected those so far published, while Guertler's textbook discusses them exhaustively. Under the microscope three distinct constituents—pure metals, chemical compounds, and solid solutions—are found. A chemical compound is one in which we get a complete merging of the constituent metals in definite atomic proportions, while in a solid solution we have a complete merging but in indefinite proportions.

Now, alloys are solutions and can be classified according to solubility. We have two main divisions as follows:

A. No compounds are formed.

Solubility in liquid state	Solubility in solid state
1. Complete	*a.* Complete *b.* Limited *c.* Zero
2. Limited	*b.* Limited *c.* Zero
3. Zero	*c.* Zero

B. Compounds are formed.

1. The compound occurs at a maximum on the freezing-point curve.
2. The compound forms by reaction between one of the metals and the liquid from which it has crystallized. In heating it dissociates before reaching its melting point.

We can further subdivide group B according to the solubility of the compounds in each of the metals, as under group A.

The Thermal Diagram. To construct the thermal diagram we use temperature time or cooling curves of individual alloys. Type cooling curves are shown in Fig. 17. They indicate the changes in the rate of cooling as the alloy changes from the liquid into the solid state. The first curve is that of a pure metal. Cooling down in the liquid condition is shown from *a* to *b*. The horizontal *bc* shows the arrest in cooling due to the latent heat of fusion as the metal freezes. At *c* the metal is completely frozen, while from *c* to *d* we have regular cooling in the solid state. The rest of the curves are those showing the freezing of type alloys.

Having obtained cooling curves of a suitable number of alloys of a pair of metals, and plotting the breaks of these curves on a temperature-composition diagram, curves can be drawn to indicate the beginning of freezing or the liquidus and the end of freezing or the beginning of melting, the solidus. Above the liquidus the alloy is completely liquid, and below the solidus all is solid, while between these two curves we

Fig. 1. VERTICAL SECTION OF ZINC INGOT

Fig. 2. CRYSTALS OF LEAD

Fig 3 SURFACE STRUCTURE OF CADMIUM
Magnified 30 Diameters

Fig. 4. STRAINED ZINC
Magnified 30 Diameters

For Explanation and Description See Text

Fig. 5. CAST COPPER
Magnified 200 diameters

Fig. 6. COLD DRAWN COPPER
Magnified 400 diameters

Fig. 7. COLD DRAWN COPPER
ANNEALED AND ETCHED
Magnified 400 diameters

Fig. 8. COLD DRAWN COPPER
ANNEALED IN HYDROGEN AT 1000° C
Magnified 400 diameters

For Description and Explanation See Text

have a mixture of liquid and solid. The changes in composition of the liquid and solid are also given by these two curves. The composition of a liquid at any particular temperature is given by the liquidus, while the composition of the solid freezing out at that temperature is shown by the solidus.

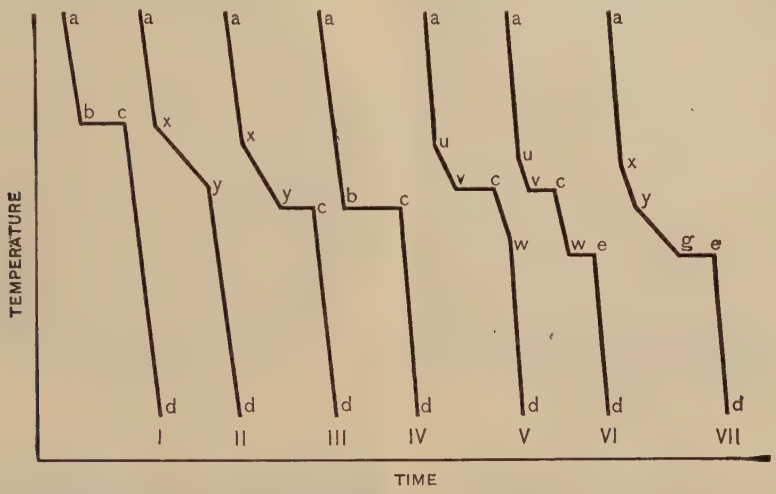

FIG. 17. TYPE COOLING CURVES.
Campbell, *Proceedings of the American Society for Testing Materials*, xiii, 1913.

Following the classification given above, the first type of thermal diagram is as follows:

Case A 1 (*a*). *Completely soluble in both the liquid and solid states.* This is shown in Diagram I, Fig. 18, in which the temperature is indicated in the vertical scale and percentage composition in the horizontal. The point *A* is the freezing point of the pure metal A, while *B* is that of the pure metal B. Then the beginning of freezing of any alloy of A and B is shown by the curve *AxnB*, which is the liquidus. The end of freezing is shown by the solidus *AmyB*. Each alloy of this series has a cooling curve similar to Diagram II, Fig. 17. The alloy begins to freeze at *x* and is completely solid at *y*. For example, take the alloy *xy*, shown in Diagram I, Fig. 18. It begins to solidify at the point *x*. The solid which begins to freeze out is not pure A, but a solid solution whose composition is given by the solidus at this temperature or *m*. Now, as the alloy freezes the composition of the solid solution freezing out changes from *m* to *y* and the composition of the liquid changes from *x* to *n*. The solid alloy consists of homogeneous grains of a solid solution of the metals A and B.

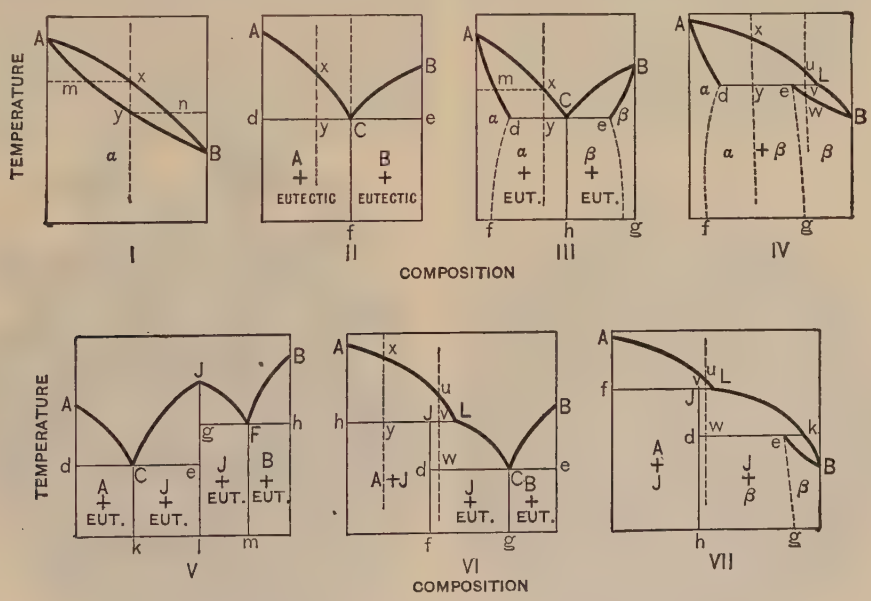

FIG. 18. TYPE THERMAL DIAGRAMS OF BINARY ALLOYS.

So it is that all the alloys of A and B, when solid, consist of solid solutions of A and B, or alpha, which form a continuous series from pure A and pure B and vary uniformly in physical

properties. Their structure can be represented by Fig. 15. When strained beyond the elastic limit slip lines appear as in a pure metal. Cold work elongates the grains as in Fig. 6, while annealing such cold-worked material causes a recrystallization, as in Figs. 7 and 8, diagrammatically shown in Fig. 16, with more or less marked twinning. As examples of this type we have *Cu-Ni, Au-Ag, Au-Pt, Cu-Pt, Fe-Mn, Fe-Co, Ni-Co.*

Case A 1 (*c*). *The two metals are completely soluble in all proportions when liquid but insoluble when solid.* The diagram is II, Fig. 18. The addition of A to B lowers the freezing point, while the addition of B to A also lowers the freezing point, and two curves are produced which intersect at the point *C*. *ABC* is the liquidus, *dCe* the solidus. Any alloy from *d* to *C* begins to freeze on reaching the temperature *AC*,

Fig. 19.

by separating out crystals of the pure metal A. In the alloy represented by *xy*, A freezes out from *x* to *y*. At *y* the composition of the liquid has reached *C* and it then freezes as a mechanical mixture of A and B and forms the ground mass for the crystals of A. Similarly any alloy between *C* and *e* begins to freeze by the formation of crystals of B. The alloy of the composition *C* is that with the lowest freezing point, which by definition is called the eutectic. As the ground mass of all alloys of this type is composed of *C* it consists of a mechanical mixture of A and B. The structure of any alloy between *d* and *C* is represented by Fig. 19, where the white grains of A are surrounded by a matrix of eutectic. Curve III, Fig. 17, shows the cooling curve of such an alloy. Cooling down uniformly in the liquid state is shown by *ax*. At *x* the metal A begins to freeze out and freezes from *x* to *y*. From *y* to *c* the eutectic freezes and at *c* the alloy is completely solid. The cooling curve of the eutectic alloy *C* is shown in Curve IV, Fig. 17. The horizontal *bc* shows the freezing out of the eutectic at constant temperature. As examples of this type we have *Pb-Ag, Bi-Ag, Bi-Au, Pb-Sb, Cd-Bi, Cd-Zn, Sn-Zn, Hg-Zn.*

Case A 1 (*b*). *The two metals are partially soluble in each other when in a solid state. A eutectic occurs.* The diagram is III, Fig. 18. The liquidus is similar to that of the last diagram, but the solidus is given by *AdCeB*. This is because the metal A will hold *d* per cent of B in solid solution, while the metal B will hold *e* per cent of A in solid solution and the eutectic only makes its appearance between *d* and *e*. Any alloy from pure A to *d* per cent of B is a solid solution of B in A, or alpha, while any alloy from pure B to *e* is a solid solution of A in B, or beta. This freezes in the same way as in Case A 1 (*a*). Alloys between these two limits consist of crystals of alpha or beta surrounded by the eutectic of composition *C*, which is a mechanical mixture of alpha and beta and not of A and B. The structure of any such alloy can be represented by Fig. 19. The method of freezing can be shown by following the alloy *xy* as in the last case. The alloy begins to freeze at *x* by separating out a solid of the composition *m*. As the temperature falls this solid changes from *m* to *d*, while the liquid changes from *x* to *C*. At *y* we have crystals of composition *d* surrounded by the liquid *C*, which is the eutectic. When completely frozen, therefore, the alloy consists of crystals of alpha surrounded by the eutectic. The curves *df* and *eg* show that the amount of B which A can hold in solid solution and the amount of A which B can hold in solid solution decrease with fall of temperature. In other words, the curves *df* and *eg* are the solubility curves of B in A and A in B in the solid state. As examples of these alloys we have *Cu-Ag, Bi-Sn, Bi-Pb, Sn-Pb, Sn-Al, Sn-Cd, Pb-Cd, Pb-Hg, Ni-Au.*

Case A 1 (*b*). *The two metals are partially soluble in each other when solid. No eutectic occurs.* The diagram is shown in IV, Fig. 18. Here the addition of B to A lowers the freezing point, but the addition of A to B raises it. The two curves forming the liquidus intersect at the point *L*. The solidus is shown by *AdeB*. As in the last case alloys from pure A to *d* and from pure B to *e* consist of solid solutions, alpha and beta. Between *d* and *e*, however, the alloys are composed of grains of alpha surrounded by beta, shown in Fig. 20, the alpha being white, the beta black. Taking the alloy *xy* as an example, freezing begins at *x* by the separation

Fig. 20.

of a solid solution as in the last case. At *y* we have crystals or grains of *d* in a liquid whose composition is *L*. Here a reaction occurs between the liquid L and the solid alpha of composition *d*, and a solid beta, of composition

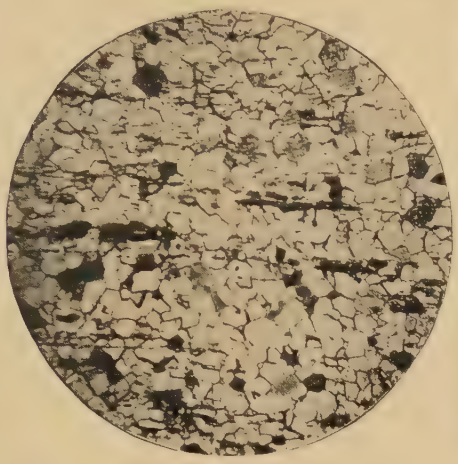

Fig. 9. WROUGHT IRON
Magnified 35 diameters

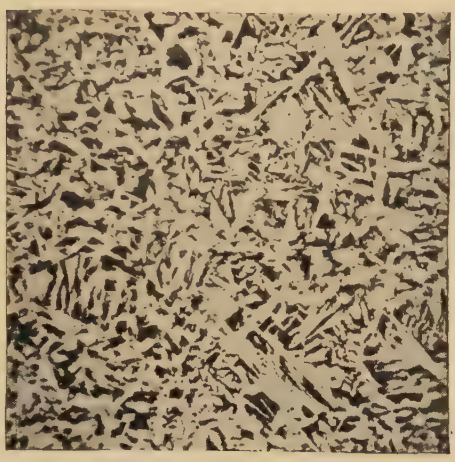

Fig. 10. LOW CARBON STEEL
Magnified 40 diameters

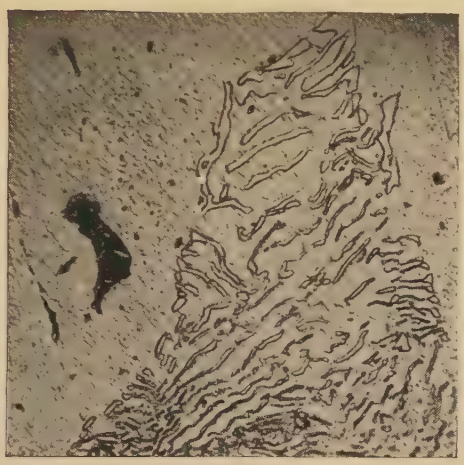

Fig. 11. PEARLITE
Magnified 1250 diameters

Fig. 12. MARTENSITE
Magnified 50 diameters

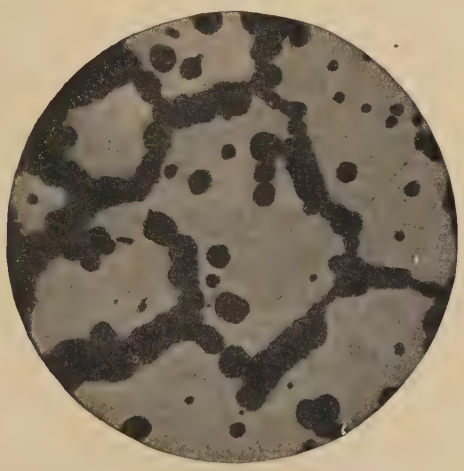

Fig. 13. TROOSTITE AND MARTENSITE
Magnified 40 diameters

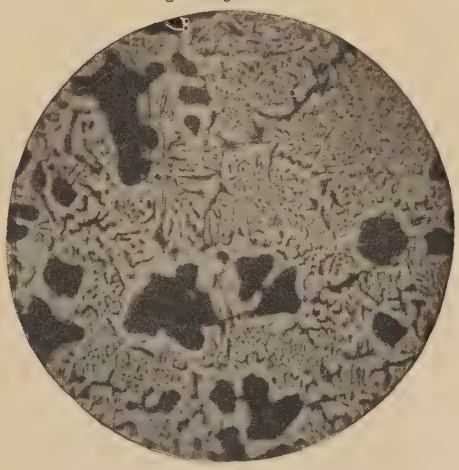

Fig 14. WHITE CAST IRON
Magnified 40 diameters

For Description and Explanation See Text

e, is produced, forming a ground mass to the alpha grains. The cooling curve of such an alloy is given in III, Fig. 17, where *xy* indicates the freezing out of the alpha and *yc* the formation of beta by the reaction between this alpha and the liquid L. Alloys between *e* and *L* show no alpha when solid, because it is all used up through the reaction. This is illustrated by the alloy *uvw*, where solid alpha begins to freeze out on reaching *u* and continues to separate until the temperature *v* is reached. Here the reaction occurs between the alpha and the liquid L, and all of the alpha is used up. Then the temperature falls from *v* to *w*, and the composition of the solid beta changes from *e* to *w*, so that when frozen the alloy is composed entirely of beta. The cooling curve is shown in V, Fig. 17, where *uv* is the separation of alpha, the horizontal *vc* is the reaction, while the *cw* is the further separation of beta as the temperature falls. At *w* the whole mass is solid. As before, the lines *df* and *eg* are the solubility curves of B in A and A in B in a solid state. *Cd-Hg, Pt-Ag, Fe-Au, Cu-Co, Cu-Fe,* the brasses and bronzes (in part), are examples of this type.

Case B 1. *A compound occurs. Its freezing point is a maximum on the liquidus.* Take the simplest case where A and B form a compound, J, which is insoluble in either A or B in the solid state. The resulting diagram is shown in V, Fig. 18. This is really compounded of two simple curves of the type II, which represent the alloys of A and J and the alloys of B and J. At *C* we have the eutectic of A and J, at *F* we have the eutectic of B and J. The liquidus is *ACJFB* and the solidus is *dCegFh*, and freezing occurs as already described in Case A 1 (*c*), while the structures are similar to that of Fig. 19. As examples we have *Zn-Mg, Pb-Mg, Sn-Mg, Cu-Mg, Al-Mg, Al-Sb, Cd-Sb, Cu-P, Cu-As*, etc.

Case B 2. *The compound forms by reaction between one of the solid metals and the liquid from which it crystallizes.* Diagram VI, Fig. 18, shows this case. *ALCB* is the liquidus, *eCdJh* is the solidus. The point *C* is the eutectic of the compound J and B. When solid, alloys from B to *g* are composed of crystals of B in the eutectic. Alloys from *g* to *f* show the compound J surrounded by the eutectic, which is a mechanical mixture of J and B. Alloys from A to *f* are composed of grains of A in a ground mass of J. Taking the alloy *xy*, it freezes out pure A from *x* to *y*, and at this temperature the liquid has the composition L, and reacts with the solid A to form the compound J. When all of the liquid is used up the alloy consists of cores of A in a ground mass of the compound J. In Fig. 20 the white areas represent A, the black ground is J. The cooling curve of such an alloy can be represented by III, Fig. 17, *xy* representing the freezing out of A and *yc* the reaction which forms J. The alloy *uvw* begins to freeze out pure A. At *v* this pure A reacts with the liquid L and is all used up. As the temperature falls the liquid continues to freeze out more J and the composition of the liquid changes from L to C, as the temperature falls from *v* to *w*, when the eutectic freezes and the resulting alloy is composed of J surrounded by the eutectic of J and B. The cooling curve of this alloy is shown in VI, Fig. 17, where *uv* shows the freezing out of A, *vc* the reaction between the liquid L and the solid A to form J, whereby all of the A is used up. *cw* shows the further freezing of the compound J, and *we* is the freezing of the eutectic of J and B. This type diagram can be modified by showing partial solubility of the metals in the compound. The freezing will take place as already described, except that instead of pure A we would have alpha, etc. As examples of this type we have *Ag-Sn, Ag-Sb, Au-Sb, Au-Pb, Fe-Zn, Al-Zn, Al-Ni, Al-Co, Mn-Sn, Pt-Pb.*

The last case is where J and B do not form a eutectic and is shown in Diagram VII, Fig. 18. Alloys from pure A to *h* freeze as in the last case. Alloys from *h* to B resemble those in Diagram IV. For example the alloy *uvw* begins to freeze with the separation of pure A. At *v* this A reacts with the liquid L to form the compound J. As the temperature falls from *v* to *w* more J freezes out and the liquid changes from L to K. At *w* we get the reaction between J and the liquid K to form beta of the composition *e*, so that when solid the alloy consists of J surrounded by beta, as in Fig. 20. The cooling curve of such an alloy is given in VI, Fig. 17, where *uv* shows the separation of pure A, *vc* the reaction to form the compound J, *cw* the continued freezing out of J, while *we* is the reaction between the liquid K and the compound J to form beta. Tin and antimony are alloys of this type, the compound of *Sb-Sn* being formed.

TERNARY ALLOYS

If we wish to show variation in composition of three metals we have to use the triaxial diagram. In Fig. 21 the corners of the equi-

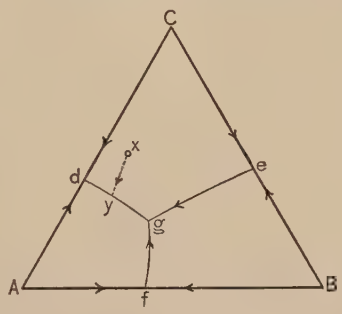

Fig. 21.

lateral triangle represent the pure metals A, B, and C. The composition of any alloy within the triangle is given by the perpendicular distances to the sides. For example, in the alloy *g* the per cent of A is represented by the perpendicular from *g* to *BC*, the per cent of B is represented by the perpendicular from *g* to *AC*, while the per cent of C is represented by the perpendicular from *g* to *AB*. The binary alloys of A and B are represented by the line *AB*. The binary alloys of B and C and A and C are represented by the sides *BC* and *AC* respectively, and these three sides are projections of such binary diagrams as are shown in Fig. 18. Temperature must be indicated perpendicular to the plane of the triangle and a solid figure results. Only one case will be shown, that in which the pairs of metals are completely soluble in the liquid state and insoluble in the solid. Each pair therefore can be represented by Curve II, Fig. 18. In Fig. 21 the side AB being a projection of Fig. 18, II, the point *f* is the projection of the eutectic C. Now if we use arrows to indicate fall of temperature we should show a

fall of temperature from *A* to *f* and from *B* to *f*, representing the curves *AC* and *BC* in Diagram II, Fig. 18. In the same way *d* and *e* represent the binary eutectics of AC and BC, the ternary eutectic being the alloy with the lowest freezing point, represented by point *g*, as shown by curves from the points *d*, *e*, and *f*, and this divides the triangle into three areas. The metal A freezes out of any alloy within the area *Adgf*, B freezes out in the area *Begf*, while C is the first to freeze within the area *Cdge*. The method of freezing of all the alloys is similar. Take the alloy *x*, which begins to freeze by separating out crystals of C, and the composition of the liquid changes from *x* to *y*, a projection through *C*. From *y* to *g* A and C freeze out side by side, forming, as it were, a binary matrix to the crystals of C. When the composition of the liquid reaches *g* the ternary eutectic freezes as a mechanical mixture of A, B, and C. Thus the line *dg* represents the binary A and C, the line *fg* the binary A and B, while the line *eg* shows the simultaneous freezing of B and C. The cooling curve of a ternary alloy is given in Fig. 17, VII, where *xy* denotes the freezing of the metal C, *yg* the simultaneous freezing of C and A, while *ge* is the arrest denoting the freezing of the ternary eutectic of A, B, and C. As examples of this type we have the series *lead-tin-bismuth*, which was worked out by Charpy, *lead-tin-cadmium* and *bismuth-tin-cadmium*, given by Stoeffel. By taking pairs of metals shown in the different diagrams of Fig. 15 the ternary diagram is greatly modified, and examples of this have been worked out by Geer, by Sahmen and Vegesack, and by Campbell.

Partial Solubility in the Liquid State. In the cases we have discussed so far the solubility in the liquid state was complete, for when the component metals were melted together a homogeneous liquid resulted. Certain pairs of metals, however, have only a limited solubility in the liquid state, and, when melted together within certain limits, separate out into two liquid layers. Each liquid is saturated with the other metal, but as the temperature is raised the amount which each metal can dissolve of the other increases so that at a certain temperature (the critical temperature) each liquid has the same composition and one homogeneous liquid results. Now by determining the variation in composition of each layer with variation in temperature we can construct a pair of solubility curves which show the amount of A dissolved in B and the amount of B in A for each particular temperature. These two curves meet at the critical temperature, and we get the completed solubility curve.

Now according to the way in which this solubility curve cuts the freezing point curves shown in Fig. 18, so will the constitution of the alloys vary, and any alloy whose composition lies within the points where the solubility curves cut the liquids will be found when solid to consist of two layers.

As examples we have *lead-zinc*, *bismuth-zinc*, *copper-lead*, *chromium-copper*, *chromium-silver*, *chromium-aluminium*, *chromium-tin*, *chromium-lead*, *manganese-lead*, *cobalt-lead*, *nickel-lead*, also *copper and copper oxide*, *copper and copper sulphide*, *iron and iron sulphide*.

In the case where the two metals are insoluble in each other at the beginning of freezing we have two liquid layers, each consisting of the *pure* metal. Each layer freezes at its own particular temperature, that of the freezing point of the pure metal. As examples we have *aluminium-cadmium*, *aluminium-lead*, *iron-lead*, *iron-silver*, *cobalt-silver*.

Changes in the Solid State. So far the changes which an alloy undergoes when it changes from the state of a *liquid solution* to a solid have been considered. *Solid solutions* may undergo very similar changes as they cool down, which changes may be represented by diagrams similar to those in Fig. 18. For example, in Fig. 18, Curve II, suppose the alloys above *ACB* exist as homogeneous *solid* solutions. The same explanation of the diagram holds good except that the pure metals are precipitated from the solid instead of freezing out of the liquid as before. Thus, the alloy *xy* on reaching *x* begins to precipitate pure A from each grain of the solid solution and this continues down to the temperature *y*, when the residual grain has the composition C. Here it splits up into a mechanical mixture of A and B very similar to a eutectic. The alloy C is not the alloy with the lowest *freezing* point, but the one with the lowest *transformation* point, hence we call it the eutectoid.

Such changes in solid solutions are found in brass and in bronze, where the beta solid solution breaks down into a mechanical mixture of alpha and the compound Cu_4Sn at about 500° C. For example, a bell metal of 20 per cent tin and 80 per cent copper if quenched from just above 500° C. would have the appearance of Fig. 20. If slowly cooled, however, this structure of alpha surrounded by beta would change at 500° C., because the beta breaks down into a mechanical mixture of alpha and Cu_4Sn at this temperature and its structure would then resemble Fig. 19. Each grain of alpha contains about 12 per cent of tin in solid solution, while the groundmass or eutectoid contains about 26½ per cent of tin, partly as alpha, partly as the compound Cu_4Sn (with 32 per cent tin).

In the aluminium bronzes a similar eutectoid occurs. The alpha is saturated with aluminium at 7½ per cent. The eutectoid contains 12 per cent aluminium; thus alloys between 7½ and 12 per cent resemble Fig. 19. The eutectoid transformation occurs at 550° C. The most important eutectoid change, however, occurs in the iron-carbon series, and to this change steel owes most of its well-known properties.

The Iron-Carbon Diagram. We now recognize that wrought iron, soft, medium, and hard steel, cast iron, both white and gray, belong to a continuous series of alloys and consist of the following constituents in varying proportions: *ferrite* or pure iron, soft and malleable; *cementite* or carbide of iron, Fe_3C, hard and brittle, 6.67 per cent carbon; *pearlite*, the eutectoid of ferrite and cementite, 0.9 per cent carbon. The above are found in steel, while in addition we find graphite in cast iron. Now, on heating, the eutectoid, pearlite, changes at about 700° C. from a mechanical mixture of ferrite and cementite into a solid solution called austenite, which, as the temperature is raised, is capable of dissolving more and more ferrite or cementite as the case may be. Austenite is a solid solution of carbon in iron, which is capable of hardening on quenching.

The occurrence and the temperature limits of the above constituents are shown in Fig. 22, which is the diagram for iron-iron carbide or cementite.

The freezing-point curve or liquidus is *ADL*, while the solidus is the curve *AEDF*, the end of freezing or, in heating, the beginning of melting. The alloy DT is the eutectic and consists of a mechanical mixture of austenite and cementite. On freezing, alloys from 0 to 2 per cent carbon consist of austenite and are steels, alloys with over 2 per cent of carbon are cast irons and consist of grains of austenite set in the eutectic (DT) if less than 4.2 per cent carbon, or of crystals of cementite surrounded by the eutectic if more than 4.2 per cent carbon.

An alloy between 2 and 4.2 per cent carbon can be well represented by Fig. 19, the grains being the excess austenite, the matrix the eutectic of austenite and cementite. The white cast iron in Fig. 14 shows the eutectic structure typically.

The diagram also shows the changes which take place in the solid solution austenite. Iron exists in three modifications: above 900° C. it is in the gamma condition, is nonmagnetic, and can dissolve carbon up to about 2 per cent; below 900° C. it cannot dissolve carbon, being in the beta condition down to 780° C. and nonmagnetic (i.e., *G* to *M*); below 780° C. it is in the alpha or magnetic condition. Therefore austenite is a solid solution of carbon in gamma iron and at 1125° C. is saturated at about 2 per cent carbon. However, the amount of carbon in solution falls with the temperature and cementite precipitates, as shown by the curve *ES*, which is the solubility of cementite in gamma iron. Again, the curve *GOS* indicates the precipitation of ferrite from the solid solution austenite. *GO* yields beta ferrite, *OS* the magnetic or alpha variety. At 700° C., or temperature *PSK*, we have the formation of the eutectoid pearlite from austenite of 0.9 per cent carbon. From 0 to 0.9 per cent carbon steels consist of ferrite and pearlite, while with more than 0.9 per cent carbon they are composed of cementite and pearlite.

The iron carbon diagram is not yet definitely settled and its development has been the source of much controversy on account of the difficulties encountered. Osmond determined the three forms of iron—alpha, which exists up to 780° C. and is magnetic; beta, which exists from 780° to 900° C. and is nonmagnetic; gamma, also nonmagnetic, exists above 900° C. and has the property of dissolving a maximum of 2 per cent of carbon. The first comprehensive temperature-composition diagram was given by Roberts-Austen (*Fourth Report to Alloys Research Committee*, plate ii, 1897. Institution of Mechanical Engineers, London; *Fifth Report*, 1899), and this consisted of the lines shown in Fig. 22, *ABC*: *aBf*, the graphite-austenite eutectic; *GOS*; *MO*; *PSK*; *SE* in part.

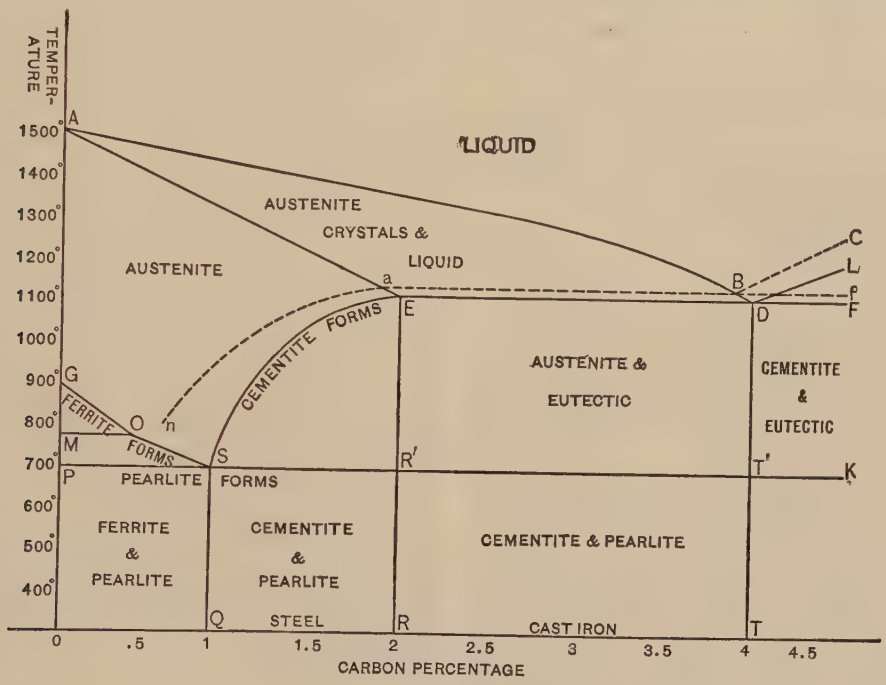

Fig. 22.

Rooseboom applied the phase rule to Roberts-Austen's work and modified the diagram by adding the line *Aa*, joining the point *a* by a line to the summit of the curve denoting separation of cementite at 1.8 per cent carbon and 1000° C. A horizontal line was drawn from this point, indicating a reaction between austenite and graphite to form cementite. Above 1000° C. we are dealing with austenite and graphite and *aBf* is the austenite-graphite eutectic. Below 1000° C. we have no graphite in a state of equilibrium, all the carbon occurring as cementite. (*Journal Iron and Steel Institute*, 1900, ii, p. 311.)

Stansfield in a paper on the "Present Position of the Solution Theory of Carburized Iron" (*Journal Iron and Steel Institute*, 1900, ii, 317) suggested a radical change. Instead of the line from *a* (denoting the further separation of graphite) cutting the cementite line *SE*, a line *an* is drawn to the left of and parallel to *ES* so as to cut *GOS*. This new line *an* shows the

solubility of graphite in austenite, which is much less than that of cementite in austenite. In other words, if cooled slow enough the 2 per cent of carbon which iron holds in solid solution ought to be rejected as graphite and not as cementite. According to the phase rule only two constituents can be present in equilibrium, and as graphite is the more stable, these two constituents must be ferrite and graphite.

Benedicks sums up the previous work and shows (*Metallurgie*, 1908, part ii) that we are dealing with two distinct and separate systems:

1. *White cast iron. Metastable.* Alloys of *austenite* and *cementite.* Produced by rapid cooling, low silicon, high manganese, etc. The solidus is shown in Fig. 16 by the curved line *AEDF*, the eutectic freezing at about 1125° C.

2. *Gray cast iron. Stable.* Alloys of *austenite* and *graphite.* Produced by slow cooling, high silicon, low manganese, low sulphur, etc., and more liable to occur in iron of high carbon content. The liquidus is *ABC*, the solidus *AaBf*, and the eutectic freezes at 1135° C. Mottled cast iron consists of grains of gray surrounded by a network of white. The gray appears to have solidified a little ahead of the white, giving us a grained structure, diagrammatically shown in Fig. 19. Thus we have two systems, graphite-austenite or cementite-austenite, on freezing. The austenite, however, is not stable, but changes over with fall of temperature. This it can do by separating out cementite along the curve *ES* or graphite along the curve *an*.

Goerens and Gutowsky concluded from their experiments that graphite is always the product of the decomposition of cementite, for cast iron freezes as austenite-cementite, but just below the freezing point may be changed over into austenite-graphite wholly or in part. (*Metallurgie*, vol. v, p. 45.)

Upton holds that white cast iron is the product of undercooling, and that Rooseboom was correct in stating that the stable constituents on freezing were graphite and austenite. (*Journal of Physical Chemistry*, vol. xii (1908), p. 507.) At a lower temperature these react to form a carbide of iron resembling cementite. The main points of his diagram are: graphite + austenite = Fe_6C at 1095° C.; at 800° Fe_6C changes over into Fe_8C and austenite; at 615° Fe_3C breaks up into Fe_2C and alpha iron (ferrite). A later research is Wittorf's (*Revue de Métallurgie*, 1912, p. 600), whose diagram shows a stable eutectic of austenite and Fe_4C at 1180° C. and 4.1 per cent carbon. Below 1130° C. Fe_4C decomposes into austenite and graphite.

The whole subject has been thoroughly discussed by Guertler (*Text-Book of Metallography*, vol. ii), who concludes that the stable system is as according to Wittorf, and that we have two metastable systems. The first shows the eutectic of graphite and austenite at 1150° C. with a eutectoid of alpha and graphite at 750° C. The second is our ordinary white cast iron with the eutectic of cementite (Fe_3C) and austenite at 1135° C. and the eutectoid of Fe_3C and alpha ferrite at 710° C. as already described. (Figs. 11 and 14.) However, at present the most satisfactory working diagram is the double one showing the two systems, stable and metastable.

The diagram explains in a very satisfactory manner the changes which take place from 0 to 2 per cent in the steel division, as in Fig. 22.

Starting with 0 per cent C or wrought iron, Fig. 9 is a section of a piece of pipe skelp (magnified 35 diameters) etched with 10 per cent nitric acid. It consists of grains of pure iron or ferrite with more or less regular polygonal boundaries and some dark patches of slag, which are elongated in the direction of the rolling. Ingot iron shows the same structure, but without the included slag, because the metal was cast from the liquid state and is steel with only a trace of carbon and other impurities. In pipe steel of say 0.07 per cent carbon we find the same grain of ferrite, but in addition there are small dark-etching areas of pearlite containing 0.9 per cent carbon. As we pass from this low-carbon steel to that containing 0.9 per cent we find the amount of pearlite increases until it finally composes the whole grain. Figure 10, magnified 40 diameters, shows a piece of medium carbon steel cut from a 3½-inch shaft. The white areas are ferrite, the dark are pearlite. Under very high magnification pearlite is seen to be a mechanical mixture of ferrite and cementite, as shown in Fig. 11, where the fine hard white plates are cementite set in a groundmass of softer ferrite. The black patch is a particle of manganese sulphide. Now, when the carbon reaches 0.9 per cent the whole steel is composed of pearlite, and in any steel up to this point the changes which take place on cooling from high temperatures are the same. Above the line *GOS* (Fig. 22) the metal is composed of homogeneous grains of austenite. The higher the temperature to which it is heated the coarser the grain. On cooling down no change occurs until the curve *GOS* is reached. The steel shown in Fig. 10 after forging cooled down normally until it reached the temperature *GOS*, when ferrite began to separate out and continued until at 700° (*PS*) the residual austenite grain changed over into pearlite.

With increase in carbon the pearlite increases and the temperature at which ferrite precipitates decreases, following *GOS*.

Above 0.9 per cent carbon a new constituent, cementite, appears as hard, bright envelopes around the grain. This cementite separates out in high-carbon steels when they cool down to the line *ES*, just as ferrite separated out of the low-carbon steel. The change in the residual austenite grain into pearlite occurs at 700° C., or *SR′*, as before.

HEAT TREATMENT

As a general rule a coarse structure means weakness. When a metal or alloy freezes, dendrites or pine-tree crystals generally form. Figure 1 shows typically the normal ingotism. In an ingot or casting of steel similar dendrites form and we have to break them up either by mechanical work or by heat treatment. Rolling or forging at a high temperature breaks them up, and the greater the amount of reduction of section brought about by the mechanical work, the finer the grain, as in the hot working of any metal or alloy. In the case of a casting we produce a fine grain by annealing or, more correctly, refining. When the temperature reaches the curve *AD* the metal begins to freeze and is completely frozen on reaching *AE*, Fig. 22. The rate at which the metal passes through this freezing range determines the grain size. When solid the casting consists of dendrites, or grains of austenite. No further change takes place on cooling until *GOS* is reached. Then ferrite begins to separate out around and in each grain

until on reaching *PS* pearlite forms. To obtain a very fine structure we have to reheat the casting to just above the line *GOS* in order to take the coarse ferrite into solution, for this gives us the finest grain. Heating to temperatures below *PS* causes no change of structure. On passing this temperature the coarse pearlite changes over into very fine-grained austenite. To complete the refining, however, we must get rid of the coarse ferrite, which we do by heating just above *GOS*. Thus the lower the carbon in the steel the higher the refining temperature. The changes which take place on heating are at a slightly higher temperature than on cooling, which is due to lag, so that in practice we have to heat say 25° C. above the line *GOS* for complete refining. Manganese, etc., make the lag more pronounced.

Occasionally such heat treatment fails to give complete refining. This is due partly to the fact that a steel casting may contain films of manganese sulphide and silicate, which act as nuclei on which the ferrite precipitated on cooling from *GOS* down to *PS*, and partly due to segregation of phosphorus.

In the heat treatment of high-carbon steel we have to heat just above *SE* to refine the casting, but such heat treatment, as a rule, gives a coarse grain, especially with very high-carbon content. But most high-carbon steel for tools, etc., comes in the form of forged or rolled bars and rods which have a comparatively fine grain. With very high carbon heating to just above *SE* causes overheating and often breaks down the carbide of iron, with the production of graphite. But on account of the fact that the envelopes of cementite tend to break down and form globules, heating to just above *PSK* generally refines the steel.

Hardening and Tempering. Hardening is heating to the austenitic condition and suddenly cooling, as by quenching in water, oil, etc. The more rapid the cooling the harder the steel; the greater the content of carbon the harder the material. The higher the temperature above *GOSK* to which the steel is heated the coarser the grain and therefore the more brittle. Hence the correct temperature to heat the steel for hardening is that point where it has just completely transformed into austenite, which is just above *GOSK*. It is not necessary to heat above *SE*, for cementite is already very hard.

Theoretically we ought to be able to prevent any change in the solid-solution austenite by extremely rapid cooling. In practice, however, this is impossible, and we find more or less decomposition in the quenched material. This decomposition is of two kinds. The outside of the grain of austenite may be changed over into a dark etching constituent called troostite; the nearer the centre of the bar, the more troostite occurs. In Fig. 13 is shown a steel with 1.4 per cent carbon quenched from a white heat. The section is taken from near the outside and the troostite occurs as dark-etching irregular envelopes to the grains of austenite and rounded patches within the grain. The centre of the bar showed comparatively little of the austenite, most of the grain having decomposed into troostite, for in the centre the cooling is much slower. Hence with very large sections it is impossible fully to harden the interior, for the heat is not conducted away rapidly enough to suppress the change of austenite towards pearlite completely. The second method of decomposition occurs within the grain itself. Curious chevrons and needles appear, with some semblance of octahedral symmetry. This is martensite. Figure 12 shows it in a steel with 2 per cent of C, $\frac{5}{16}$ inch square, quenched from 1100° C. The thin envelope to the very coarse grain is cementite. The grain itself shows the typical chevron structure of martensite. Martensite is extremely hard, austenite (found pure in nickel or manganese steel) is comparatively soft. Troostite is less hard and less brittle than martensite. Troostite itself changes over into submicroscopic pearlite, called sorbite, which is extremely strong and ductile. There is a whole range of structures between typical austenite, troostite and martensite, and sorbite, depending on the size of the section, the rate of quenching, and the temperature of quenching. The temperature from which the material was quenched determines the grain size.

Material as quenched is usually hard and brittle. By reheating to over 200° C. to 300° C. we "temper" the material, which causes a further decomposition of the austenite within the grain, but does not alter the grain size. The brittleness is decreased, with some loss of hardness. Within the grain the martensitic structure becomes more pronounced through the formation of troostite and sorbite and then becomes hazy, and finally sorbite and pearlite, and then pearlite alone, result, and the material is then dead soft.

Casehardening and Cementation. This is accomplished by heating wrought iron or low-carbon steel into the gamma range, packed in carbonaceous material, such as charcoal, bone meal, lampblack, etc., or by means of carbonaceous gases. According to Giolitti (*The Cementation Process of Iron and Steel*, 1915) the gamma iron absorbs carbon mainly through the agency of carbon monoxide gas.

The process of casehardening can be readily followed under the microscope. When the specimen has not been quenched a cross section can be cut and the changes in structure followed as they pass from the outside of cementite plus pearlite, or pearlite alone, through a zone of pearlite into ferrite plus pearlite, which gradually decreases in amount until finally the normal material is reached, which shows the limit of carbon penetration.

Alloy Steels. The metallography of alloy steels forms a subject in itself. They may be classified into three groups according to the predominant constituent: (1) pearlitic, (2) martensitic, (3) austenitic, of the air-cooled specimens. The presence of the alloy profoundly affects the critical temperatures, especially *GOSK*, and the ease with which the transformations occur. As an example of group 7 we have nickel steel with 3.5 per cent nickel. This closely resembles ordinary carbon steel in structure, although the grain size is usually finer, and when quenched the martensite is very much more pronounced. Chrome-steel, nickel-chrome, chrome-vanadium, nickel-chrome-vanadium, silico-manganese, etc., are all pearlitic. When quenched and tempered, however, martensite is very predominant and there are marked differences both in properties and structure. Manganese steel (Mn 12 per cent), when slowly cooled or cast, is composed of austenite with more or less carbide in and between the grains,

as in Fig. 12; for the manganese present has suppressed the *GOSK* change (Fig. 22) entirely and we have only the curve *ES* left. Quenching from 1050° C. prevents the separation of the carbide and the material is composed of polygonal grains of austenite. (See Fig. 8.) As examples of the third group we have air-hardening and high-speed steel, but their structure is by no means typical martensite. Small white grains of carbide usually occur in a more or less complex groundmass which may be at times austenite, at others martensite, at others pearlite. The differences, however, run parallel with the difference in hardness and physical properties.

Functions of Metallography. In conclusion, metallography does not compete with chemical analysis or physical testing. It supplements them. Chemistry tells us what elements are present; metallography shows us how they occur in regard to grain size, segregation, inclusion of impurities, etc. It is a method of determining cause of failure as well as of distinguishing material. In some cases this is easily done, as, e.g., distinguishing between wrought iron and steel, properly and improperly refined castings, segregated rail steel, etc. Some problems are more difficult, as the study of hardened alloy steels, especially high-speed, the corrosion of tubes, both of iron and steel, and of brass, etc. As in all scientific work, the answer comes sooner or later, and subjects at present unsolved may in time be unraveled by metallographic means.

Bibliography. Several publications available for consultation have devoted considerable space to metallography, viz., the *Zeitschrift für anorganische Chemie* (Leipzig); *Zeitschrift für physikalische Chemie* (ib.); the *Journal of the Iron and Steel Institute* (London); the *Revue de Métallurgie* (Paris); *Metallurgie* (Aachen), now divided into "Ferrum" and "Metal und Erz"; the *Journal of the Institute of Metals* (London); while the *International Journal of Metallography* (Berlin) is devoted to it exclusively. Several introductory textbooks have appeared, notably C. H. Desch, *Metallography* (New York, 1910); G. H. Gulliver, *Metallic Alloys* (Philadelphia, 1913); Rosenhain, *Introduction to Physical Metallurgy* (New York, 1914). The theoretical side is most ably dealt with in William Guertler, *Metallographie* (Berlin, 1912 et seq.), of which two volumes had been published in 1915.

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MET'ALLUR'GY (from Gk. μεταλλουργός, *metallourgos*, metal working, from μέταλλον, *metallon*, metal, mine + ἔργον, *ergon*, work). The art of extracting metals from their ores and adapting them to the various purposes of manufacture. As the oldest written records of the world's history contain references to metals and their uses, the indications are that metallurgy is an art that was practiced in very early times. The ancient Egyptians and Hebrews were skilled in the working of metals, and the art must have been known and practiced before the dawn of history. Metallurgy may be divided generally into two grand divisions, mechanical metallurgy and chemical metallurgy. Mechanical metallurgy is that procedure usually included under the head of ore dressing (q.v.) and means the mechanical separation of a metal from its ores without recourse to chemical assistance. When the metals occur in a native state this procedure is possible, but, since such occurrence is comparatively rare, purely mechanical metallurgy is not widely adopted. There are a few cases in which it is applicable, such as when native gold occurs in coarse form. In such cases the rock may be broken fine enough to liberate the particles of gold, which then may be separated from the rock by water concentration. Chemical metallurgy includes all processes in which chemical changes are essential. This branch includes by far the greater part of the systems actually in use. The recovery of metals from all ores in which they occur in other than free and native condition involves chemical changes and is therefore within the realm of chemical metallurgy.

Most systems of ore treatment are a combination of mechanical and chemical metallurgy. In a broad way there are five systems under which all metallurgical processes may be classified. These are *concentration*, *amalgamation*, *leaching*, *roasting*, and *smelting*. Concentration is the removal of the gangue or barren part of an ore from the rich or mineral-bearing part, or, in other words, concentrating the metal into much smaller bulk than it occupied in the original ore mass. There are two methods of accomplishing this result. The first is by *gravity separation*, in which either water or air is used as a suspending medium, allowing the heavier metal-bearing portion to settle and thus separate itself from the siliceous gangue. *Flotation*, the second system, separates mineral from gangue by virtue of causing the former to float on the surface of water, either by the use of oil, oil and acid, or by utilizing the principle of surface tension. Flotation is a comparatively new process, the field of which is constantly widening. It is being largely applied at the present time in the wet treatment of copper.

Amalgamation is that system of metallurgy which makes use of the property which mercury possesses of amalgamating readily with gold and silver. Ores are crushed and mixed with mercury, the resulting amalgam being then separated by washing out the remaining gangue. The amalgam is then subjected to a distillation

process in which the mercury is volatilized, leaving the pure metal behind. The amalgamation treatment is usually limited to those ores in which gold occurs free and uncombined, since the metal in chemical combination is not amalgamable. Occasionally silver ores may be amalgamated, an example being the rich ores of the Cobalt district, in Canada, but silver rarely occurs native and is therefore not often amalgamable. See GOLD.

Leaching is the system of extraction in which the ore is treated with aqueous solutions of a solvent which acts upon the metal to be recovered. Three classes of solutions are used under special circumstances—acid, saline, and alkaline. As an example of the first may be mentioned the leaching of copper ores with sulphuric-acid solutions. Use of saline solutions may be typified by the leaching of precious-metal ores with cyanide solutions or the leaching of silver ores with sodium hyposulphite. Among alkaline treatments are the ammonia solutions often used for dissolving copper oxide from ores. Leaching may be accomplished by grinding the ore to a granular form consisting of particles varying in size from 0.5 inch to 0.002 inch, placing it in tanks equipped with false filter bottoms, and applying the solvent solution at the top, allowing it to percolate through the ore bed; or the rock may be ground to an exceedingly fine condition and mixed with the solvent solution, being maintained in suspension by mechanical means and separated after the treatment period by filtration or settlement. Other methods which have been well known are included in leaching—chlorination for example. The class includes all the wet metal-dissolving processes.

The roasting system of treatment includes those in which the ore is heated with access of air, but short of the point of fusion. In this way carbonates, such as those of zinc ($ZnCO_3$) and lime ($CaCO_3$), are brought down to the oxide form, the mineral losing carbonic-acid gas. The process also serves to drive off elements which occur in combination with some minerals, as, e.g., the roasting of sulphides, driving off the sulphur as sulphur dioxide and leaving usually an oxide of the metal. Roasting is widely practiced, but can only rarely form a complete cycle of metal production from ore.

Smelting is the final great class of metallurgical processes and may be called the most important of all of them, since it produces by far the greatest quantities of metal. The process consists of the application of heat together with the addition of materials which induce chemical reactions, the result being molten metal and a melted slag composed of the ore gangue and materials which have been added as flux. The process is one which is applied in special ways to a wide variety of metal ores. It may, and often does, account for the entire cycle between crude ore and metal in the form of raw material for manufacture. Smelting is accomplished usually in furnaces of one of two types—the reverberatory furnace, in which the material to be treated is placed on a bed separate from the fuel or heating agent; and the shaft or blast furnace, in which fuel for generating the required heat is mixed with the ore and flux charge.

Smelting is an extremely ancient process, since the extracting of iron from its ores in blast furnaces was practiced among the hill tribes of India at least 3000 years ago. Iron ore and charcoal are put into a small blast furnace, worked with a goatskin bellows, and several hours are required to produce the small quantity of iron a man might carry in one hand. Smelting is utilized in the recovery of iron, copper, lead, zinc, gold, silver, antimony, nickel, and many other metals. In the recovery of many of these metals it is not the only process which may be used, but in the cases of iron, copper, lead, and some others it is practically the only system in commercial use. Gold and silver are recovered by practically all the classes of metallurgical treatment, but a great quantity is produced directly through smelting.

Electricity has become largely used in metallurgy in recent years, and its application has given rise to the coining of the term "electrometallurgy." It is not, however, a division of the metallurgical art, since the basic principles have not been changed in its use. Electrical action is employed to provide, either more conveniently or more cheaply, means for generating heat or inducing chemical changes that were formerly obtained in some other way. For example, electric furnaces have been built for smelting iron by the heat of the electric arc. Here electricity has supplied heat in a convenient way, but the process of smelting has been in no way changed. In a like way many metals are precipitated from their solutions by the use of the electric current, promoting economy and convenience, but acting essentially as auxiliaries to the formerly known processes. It seems, therefore, that the creation of a metallurgical division under the heading of electrometallurgy is hardly justified at this time. An ore can often be treated entirely by systems that come under but one of the general metallurgical methods, but often a combination of two or more of them is required to effect the recovery of a single metal, and at times all of them are used upon one ore. Thus, a gold ore might be subjected to amalgamation, concentration, and leaching with cyanide solutions, and the concentrates produced might be roasted and finally smelted, thus combining in the treatment of a single ore some process under each of the general divisions of metallurgy. Some of the mechanical operations of metallurgy pertaining to treatment of ores are described under ORE DRESSING; other mechanical operations, referring to the working of metals, as well as the chemical treatment, which differs in detail for each metal, are described in the articles on the various metals. See ALUMINIUM; COPPER; GOLD; IRON AND STEEL; LEAD; MERCURY; NICKEL; PLATINUM; SILVER; TIN; ZINC; ETC.

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METALS AND METALLOIDS. See PERIODIC LAW.

METAL WORK. A term applied to decorative objects made of metal. The metals and alloys most often used are iron, bronze, brass, gold, silver, copper, tin, and lead, and the principal methods of treatment employed are casting, hammering, spinning, drawing, and stamping. (For description of these processes, see

FOUNDING; REPOUSSÉ.) Because of its scarcity and value the use of gold has generally been confined to small objects of personal luxury and adornment, although the Greeks frequently used it, in connection with ivory, for statues of the gods. (See CHRYSELEPHANTINE; PLATE; JEWELRY.) The use of silver is also thus limited, though to a less extent. Although copper in a pure state was employed for ecclesiastical ornaments from the twelfth to the fifteenth century, its chief use has always been as an alloy with tin in the form of bronze. In this form it is the metal most used by sculptors for both statues and reliefs. This is due to the fact that its high fluidity when melted, its slight contraction upon cooling, and its hardness render it peculiarly adapted for casting. (See BRONZE; and on bronze doors, see DOOR.) Brass, an alloy of copper and zinc, was used during the Middle Ages for sepulchral slabs, the design and lettering being engraved. (See BRASSES, SEPULCHRAL.) Modern lamps and lighting fixtures are usually made of brass, but sometimes of bronze; andirons and other fireplace furniture, of iron, sometimes with brass ornaments. Brass plate lends itself to spinning just as naturally as tin plate (iron or steel plate coated with tin) does to stamping. The domestic dishes and utensils that formerly in Europe and America were made of copper, brass, or pewter, are to-day, except in the Orient, stamped inexpensively by automatic machines out of tin plate. By reason of its great contraction upon cooling iron is less adapted to casting; but its extreme malleability and adhesive qualities when heated only to redness render it easy to forge under the stroke of the hammer. From the thirteenth century to the eighteenth it was extensively used with high artistic success for screens, gates, and the like, though the attempted revival in our day cannot be pronounced equally successful. (See IRON AND STEEL.) Steel is also extensively used in the beautiful inlay work of Oriental nations. During the Gothic centuries iron was the favorite metal of the locksmith; among the Greeks and Romans, and since the beginning of the Renaissance, brass and bronze. See LOCK; DAMASKEENING; INLAY; INDIAN ART.

Architecture. The metals chiefly used in architecture are iron and steel, bronze, copper, lead, and zinc. Their uses may be broadly divided into the structural and the decorative.

Iron and Steel.—It is only within the past century that these have come into extensive use for structural purposes. Their applications in modern fire-resisting structures are treated in the articles FIREPROOF CONSTRUCTION and SKYSCRAPER (qq.v.). Another important field of use —and, indeed, that for which they are peculiarly adapted and to which they were applied long before the development of modern fireproof construction—is the roofing of wide spans by means of trusses. The earliest example of this use, which the French inaugurated and have developed with consummate artistic skill, was the iron dome which replaced the earlier wooden dome of the Halle au Blé, Paris (now the Bourse du Commerce), after the fire of 1811, and which is still in perfect condition. In 1839 an iron-framed roof was built over the vaults of Chartres Cathedral. In both of these the main members were of cast iron. The great Halles Centrales in Paris by Baltard (1846–52) and the Crystal Palace at London (1851) employed cast-iron columns with trusses chiefly of wrought iron. In all modern work wrought iron and steel have almost completely displaced cast iron. Very notable French examples of artistic construction in iron were the exhibition buildings of 1878, 1889, and 1900; the roof of the "Salle des Machines" (1889) had a span of over 360 feet, with pointed-arched trusses of great beauty. In the vaulted ceilings of the Bibliothèque Nationale, Bibliothèque Ste. Geneviève, and church of St. Augustin the French in 1850–72 made interesting experiments in combining a decorative iron framework with brick, terra-cotta, or plaster fillings. The earliest iron structure in the United States was the beautiful Crystal Palace of the World's Fair at New York in 1858, in Bryant Park; it was unfortunately destroyed by fire the same year. The iron and glass roof of the train shed of the first Grand Central Depot in New York (1871) was an unusually elegant work; but, in general, American examples lack the elegance of the French. The widest span ever roofed with iron (or steel) and glass was that of the Liberal Arts Building of the Chicago World's Fair (1893); the arched trusses had a clear span of 387 feet and a height of 211. Many very beautiful bridges have been built with spans of steel arches; e.g., the Eads Bridge at St. Louis, the Washington Bridge over the Harlem at New York, the Alexander III Bridge at Paris, etc. It was the great cost and scarcity of iron that prevented its wide use for construction previous to the nineteenth century; but an iron beam bedded in cement was found among the ruins of the Baths of Caracalla (Rome, 202 A.D.), proving that the Romans used it in exceptional cases. In the Middle Ages its chief use was for gates, grilles, decorative hinges, and (in Italy) tie-rods; in the Renaissance it appears also in balconies and balustrades.

Bronze.—For decorative work in architecture bronze holds the place of honor. It was early hammered into reliefs by the Assyrians (Balawat Gates) and the Mycenæans; cast in large masses by the Phœnicians, as in the columns "Jachin" and "Boaz" for the Temple of Solomon (c.1000 B.C.), and the great laver for the court of the same temple; employed by the Romans for the roof of the Pantheon portico (c.120 A.D.) and for its superb doors; in the Middle Ages for bronze-plated and solid-bronze doors of great splendor; in the Renaissance and in modern times for sculptural adornments of all kinds—for doors, grilles, railings, candelabra, and such objects as mast bases (e.g., those at Venice in front of St. Mark's); and also for the minor adornments and details of furniture, tombs, etc.

Copper, zinc, and *lead* in sheet form are used for covering roofs in place of slates or tiles, and for gutters and spouts, on account of their resistance to the weather. Copper and lead, beaten or cast into decorative forms, are used also for the finishing and adornment of roofs, in the forms of hip rolls, crestings, finials, and the like; and copper and galvanized iron for gutters, *chéneaux,* or high gutter fronts, and even cornices. The use of sheet metal for hollow counterfeits of stone is a reprehensible modern device for cheap pretentiousness which, though widely practiced as an organized trade, deserves no mention as a fine art. The use of bronze in sculpture does not belong in the scope of this article. See SCULPTURE.

Bibliography. The authorities on the tech-

nique and history of the different kinds of metal work will be found under the titles cited above. Among the special manuals on the subject which have been written at different periods are: the treatise of the Monk Theophilus, "Diversarum Artium Schedula" (twelfth century), published in *Quellenschriften für Kunstgeschichte, VII.* (Vienna, 1877); Cellini, *Trattati dell' oreficeria e della scultura*, edited by Milanesi (Florence, 1856); Vasari, *Tre arti del disegno*, part ii, edited by Milanesi (ib., 1882); Garnier, *Manuel du ciseleur* (Paris, 1859); Hefner-Altenach, *Serrurerie du moyen âge* (ib., 1869); W. W. Kent, *Architectural Wrought-Iron* (New York, 1888); F. S. Meyer, *Handbook of Art Smithing* (ib., 1896); *Lexicon der Metaltechnik* (Vienna, 1900); Codron, *Travail des métaux dans les ateliers de construction mécanique* (London, 1901); Haas, *Der Metallarbeiter* (1902); J. S. Gardner, *English Ironwork of the XVII and XVIII centuries* (ib., 1911).

METAL-WORKING MACHINERY. The purpose or function of both of the two general classes into which metal-working machinery is divided is to apply power to the forming or shaping of metallic raw material into the desired finished or wrought forms as required by commerce, industry, or the engineer's designs. In one class are the power-driven machines which are designed to produce one article only in great numbers (and possibly in varying sizes) and usually with some degree of automatic action so far as human supervision is concerned. These are properly styled *special machines.* Such are screw-making machines, bolt threaders, nut tappers, gear cutters, spring-making machines, and the like. They usually turn out a product complete, or a process complete, with little or no requirement for subsequent finishing. The other class of power-driven forming or shaping machines includes those which are not special but general in their function and operation, adaptable for doing all kinds of work in their classes on all shapes of stock or raw material. These are properly called *machine tools* and are controlled by the intelligence of the workman and are not to be designated as automatic in any sense. They can of course be made to produce large numbers of duplicate articles, but this is not their normal use. They usually perform a process, or one of several processes, on an article in the course of its production, but they are not machines of production or manufacture in the sense that the special machinery is which turns out a finished product in one completed continuous operation.

It is obvious that the special-machine class of metal-working machinery is as large and as diversified as the mechanical ingenuity of designers and the needs of economic manufacture. Such machines have found their greatest development in the construction of parts for sewing machines, typewriters, arms, cartridge work, motor vehicles, and metallic articles in general.

Metal-working machinery in both classes operates to form or shape the stock or raw material, first by bending or pressure, which creates no chips or leavings; second, by shearing, which separates the blank or work from the general mass or stock, again without chips when dies are used; third, by a paring process, in which the metal which is superfluous is reduced to chips by a cutting tool acting upon the surface or by abrading machines or grinders which comminute the material attacked. Machine tools will include in the first class hammers, presses, and riveting machines; in the second class punches and shears; and in the third class drills, lathes, and boring machines,

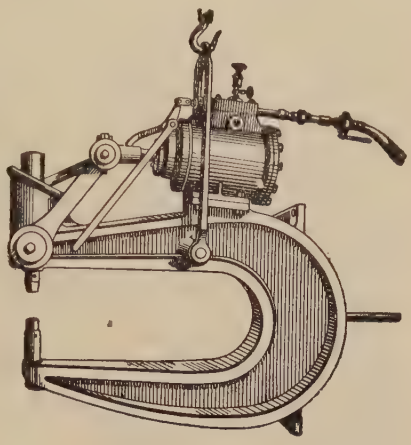


FIG. 1. RIVETER.

planers, surfacers, and milling machines for producing plane surfaces, and emery wheels for sharpening and for producing true surfaces.

Tools of Pressure or Impact. The important tools in this class are hammers and riveting machines. These, however, usually act on metal which has been softened and made plastic by heat, and are therefore more properly forging machines. See FORGE, FORGING.

Riveters are employed for driving and heading hot rivets in making riveted connections in boiler work, in bridge work, structural work, etc. They are built in a great variety of forms, but the most usual portable form derived from the larger stationary types has a U-shaped frame or yoke having at the ends of the arms interiorly projecting dies, one of which is stationary while the other has a reciprocating motion. The rivet after being inserted in the hole is squeezed endwise between these two dies until it clamps the work together and a head is formed. Figure 1 shows a common form of such portable riveter.

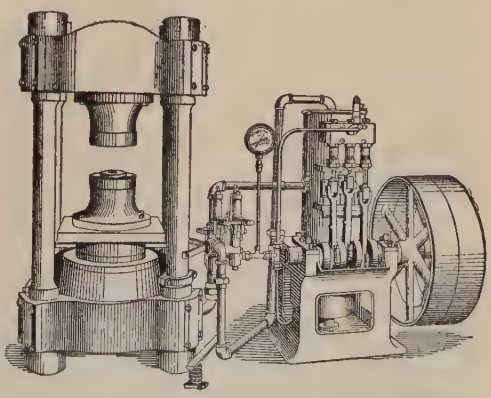


FIG. 2. HYDRAULIC PRESS.

The moving die is operated by means of a steam or compressed-air cylinder. The more massive stationary machines are designed for boiler shells and flues, and the work is presented to

them by cranes. Such riveters are often operated by hydraulic pressure.

Presses are used for forming sheet metal into desired useful forms by means of pressure between dies. Figure 2 shows a hydraulic press for such work as watchcase making which is operated by a belt-driven pump. The same type of machine of larger capacity will be used for flanging boiler plate or shaping armor plate for vessels. The operation of presses of this style is described in the article on the hydraulic press (q.v.). Presses are made for both the hot and cold working of metals. A form of hot-working press, generally horizontal in action, used in bending axles and frame members for motor vehicles, rails, and other structural shapes, is called a bulldozer. The illustration Figure 3 shows a familiar form of bulldozer press. The cold sheet-metal-forming presses for lighter shapes are usually vertical and can produce quite complicated forms in several successive processes. The drop press is also in this class.

Bending rolls are used for bending metal plates to suitable curves for boiler and tank work. They usually consist of three rolls, arranged in the form of a triangle, between which the plate is drawn by the rotation of the rolls.

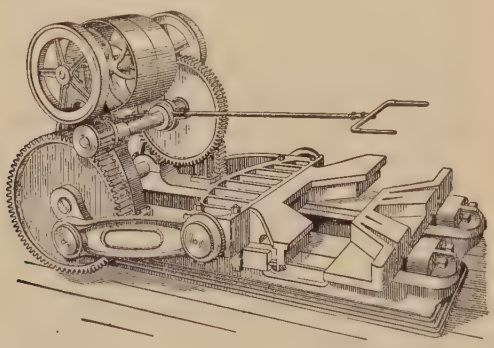


Fig. 3. BULLDOZER PRESS.

The relative adjustment of the rolls determines the curve to which the plate is bent. The accompanying plate shows a horizontal bending roll operated by a special steam engine. These rolls will take in plates 24 feet wide. Vertical rolls of similar construction are also made.

Tools for Shearing or Punching. The tools in this group operate by cutting metal of relatively thin stock, so as to separate a desired shape from a larger mass of stock or to cut holes in the latter by a punching process. The metal is sheared along the parting line, and the tool must have power to overcome this considerable and massive resistance along an area of some magnitude and extent. Punches operate by the thrust of a cylindrical or spirally ended cylinder plunger or tool forced through the metal, while the edges of the desired hole are held up and limited by a die below it. Single and multiple punches are built capable of punching one or several holes at once. For light work punches are usually driven by belts, but for heavy work individual steam engines or hydraulic cylinders are the motive powers used. Where holes are to be punched at regular intervals automatic spacing tables are often used in connection with punches. Figure 4 shows a single punch of familiar construction. Horizontally acting punches are also constructed.

Shears are used for cutting off or shearing metal plates and shapes, and resemble punches in construction and operation except that the punching tool and die are replaced by cutting edges which slide past each other like the blades of scissors. Figure 5 shows a type of plate

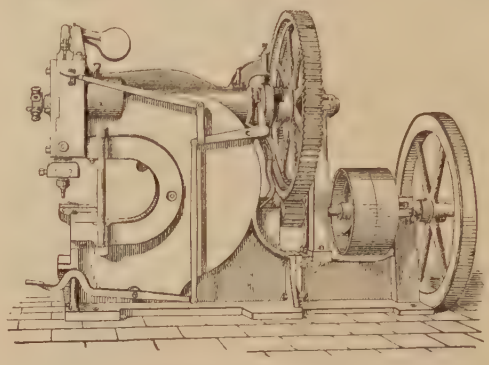


Fig. 4. PUNCH.

shears. Machines of this kind are built wide enough to shear plates 10 feet wide. For shearing angle-iron and other shapes special forms of shears are often made.

Tools for Paring Chips from the Stock. Tools in this class are historically the oldest, since they are developed from the hand-operated devices of the earliest industries. The principal tool in this group is the lathe, sometimes called the "king of machine tools." Here the work is revolved by power, and the point of the cutting tool held rigidly against undesired motion and fed parallel to the axis or at right angles thereto will cut away by a wedging action the metal which is outside of the surface of revolution to an extent determined by the position of such cutting point. Lathes turn cylinders, cones, and surface of revolution. They can also bore or generate hollow surfaces of revolution. They are driven either by belts or electric motors self-contained in their structure, with or without gearing. They have capacities from the smallest machine used by dentists and jewelers up to

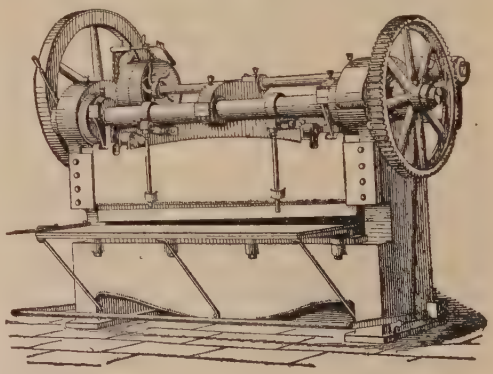
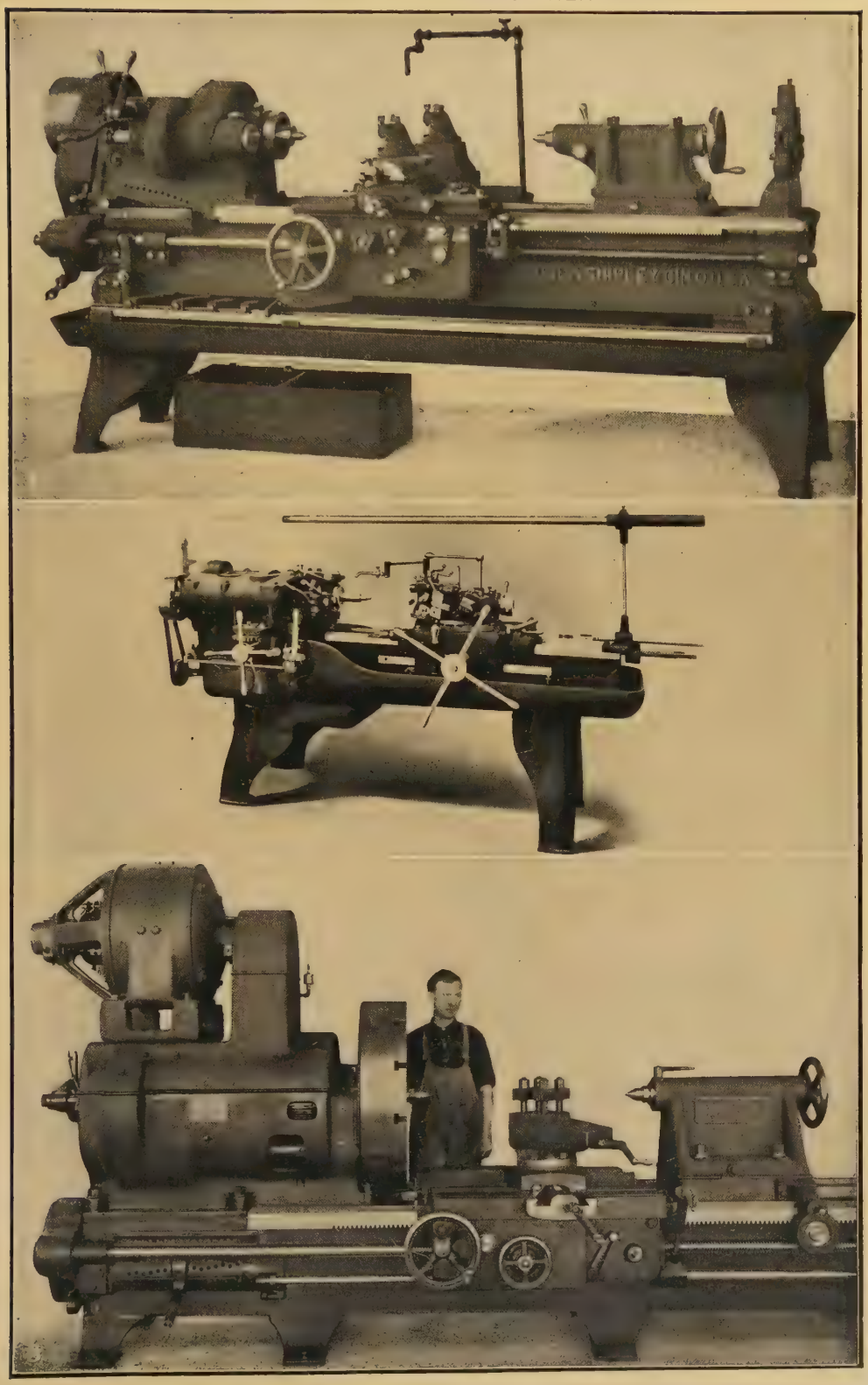


Fig. 5. SHEARS.

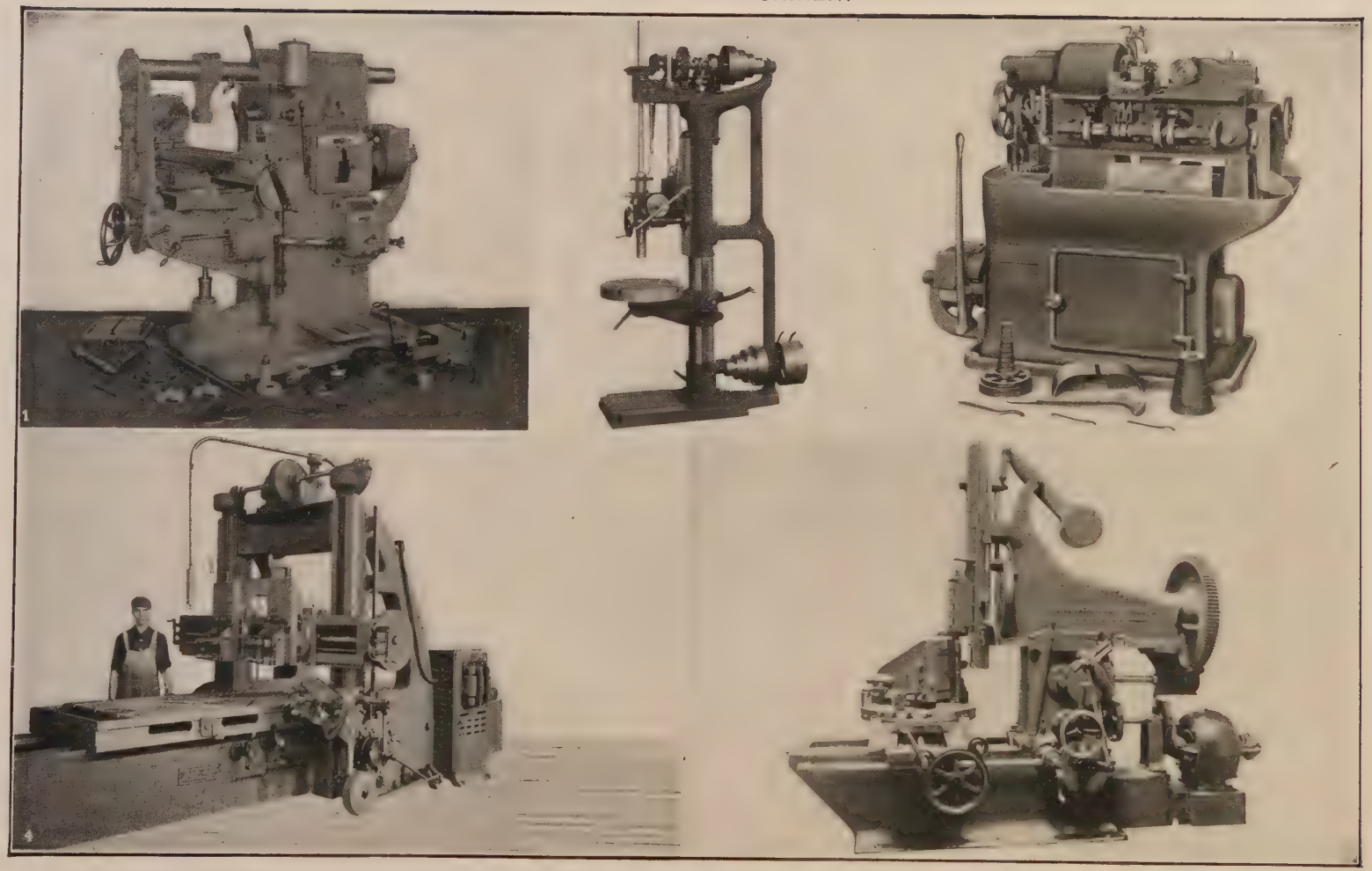
the massive ingot lathes or those for machining the driving wheels of locomotive engines or the flywheels of steam engines. The work, firmly held in a chuck, revolves in the lathe, and the tool is rigid except for the feed motions im-



TYPICAL AMERICAN LATHES

1. SELECTIVE HEAD LATHE
2. TYPICAL TURRET LATHE
3. TRIPLE-GEARED ENGINE LATHE WITH QUICK CHANGE GEARS, MOTOR DRIVEN

METAL WORKING MACHINERY



1. HEAVY UNIVERSAL MILLING MACHINE WITH CONSTANT SPEED DRIVE
2. A 21-INCH SLIDING HEAD HEAVY PATTERN UPRIGHT DRILL
3. AUTOMATIC SCREW MACHINE
4. A 42-INCH PLANER WITH TWO HEADS ON CROSS RAIL AND ONE SIDE HEAD AND WITH REVERSING MOTOR DRIVE
5. A SLOTTER DRIVEN BY ELECTRIC MOTOR

parted to it. The axis of revolution may be either horizontal or vertical. The lathe passes into the boring machine when the work is held rigidly on a chuck or faceplate and the tool is driven by power and fed to its work. Boring machines are used in boring and rifling guns and gun tubes and sleeves and in making true cylinders for engines and motor vehicles.

The boring machine is differentiated from the drill or drill press only by the diameter of the hole it cuts or forms. The drill usually forms its hole by cutting into the solid; the boring machine cuts on the sides of a hole already formed and does not cut at the bottom or end of such hole. A drill does not cut holes over 2 inches in diameter; a drill cuts on its end and not its sides. The lathe as a general machine tool can be transformed into a special machine for rapid production by the expedient of mounting special cutting elements or tools in a head of proper construction and feeding these tools in succession against the revolving stock. As these carrying heads resemble a turret of a warship in form and movements, such lathes are called turret lathes. The turret is usually on a vertical axis and is borne on a bed carriage; horizontal turrets are used in certain designs. The use of stops eliminates the necessity of pauses to caliper or measure the work in progress, and the entire product will be of the same dimensions until the tools wear.

Drill presses similarly become special tools when multiple spindles in determined relations to each other bore several holes at once at standard distances and positions. The plates illustrate standard drills and boring machines. The universal form of the drill press is the radial drill, in which the drilling spindle has adjustments for position both laterally and in and out and the work is held rigidly upon a faceplate or table or on a floor plate which is truly at a right angle to the drill spindle in all the positions of the latter.

The second group of tools which shape by cutting chips from the surface are the planers and shapers, which have linear motion only. In the planer the tool is held rigidly except for feed motions and the work moves against the tool; in the shaper the work is held in a chuck or on a table and the tool reciprocates back and forth over it. The planer will develop a surface as nearly plane as are the ways which control the motion of the bed; the shaper will develop a surface as plane as the springing of the tool carrier will admit. The latter machine is limited to work on smaller flat or curved surfaces. The slotter is a shaper with the stroke vertical instead of horizontal, and is used for working and finishing locomotive frames, for key-seating and similar work where it is convenient to have the work lie in a horizontal plane and be formed by paring metal at right angles to its greatest dimension.

The planer rarely or never becomes a special machine; the shaper becomes one when its principle is used to form the teeth of gears by having a reciprocating cutter develop the elements of a tooth profile by following the outline of a former having the desired shape, while the gear blank is held continually in the line of the axis of its proposed revolution. Planers and shapers usually cut in one direction or traverse only; to save time the idle traverse is made at higher speed. Such tools are said to have quick return.

The fourth group of machine tools acting to form metals by cutting or paring the surface is that in which the work is rigidly held except for feed motions and the cutting tool revolves against or over the work. The cutters have multiple cutting edges like a circular saw. Hence they last a long time before regrinding makes a readjustment necessary, and duplicate shapes and dimensions can be cheaply and exactly reproduced in manufacture. Such machines are called milling machines, and the revolving cutters are called mills. The mill may have a desired profile to produce a desired shape on the stock over which it moves as it revolves. Milling machines may have vertical or horizontal axes for the cutters. A special form of edge miller is called a profiling machine. Millers may generate and cut spirals or helices, and are much used for cutting the teeth of gear wheels. They then become special machines, but can easily be made automatic as respects the dividing of the circumference of the wheel into equal parts and cutting the tooth space of the required shape. Figure 6 illustrates the so-called plain milling machine and Figure 7 the range in types of cutters which may be used.

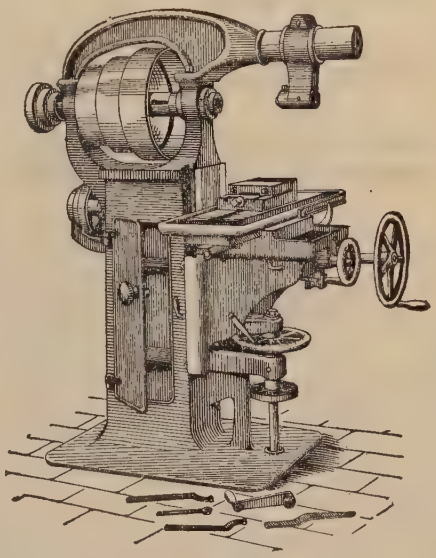


Fig. 6. PLAIN MILLING MACHINE.

The milling machine is the highest development of the machine tool in its class and with the turret lathe lies at the bottom of American supremacy in rapid and cheap production. It will work to a dimension varying only one-half of one-thousandth of an inch from a desired standard size.

The metal saw is in the class of the milling machine for cutting beams and other metallic masses, like armor plate, to shape. The saw may have inserted "bits" of hardened steel in a softer plate, or diamond facets may be similarly used, or the teeth may be made in the saw disk itself. In Figure 8 is shown the beam saw where the beams are clamped in place and the revolving saw traverses at right angles. Less usual is the toothless saw, a disk of soft steel, about three-sixteenths of an inch thick and perhaps 42 inches in diameter. This disk is made to revolve with a speed at the circumference of

15,000 feet per minute, and grinds its way through the metal. If the speed is increased to about 25,000 feet per minute, it becomes a fusing disk and melts the abraded particles. The work should be slowly revolved as fed to

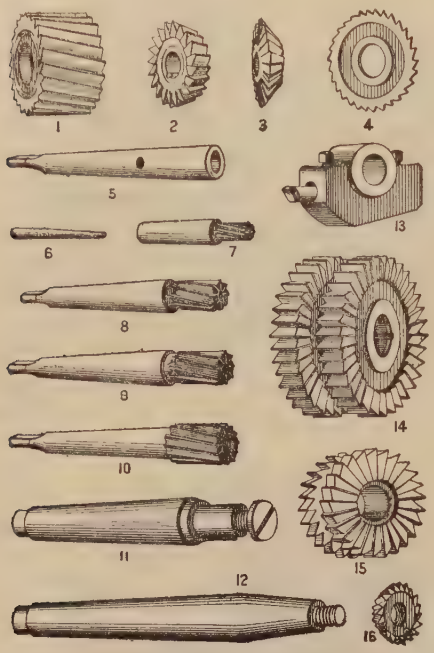


FIG. 7. MILLING CUTTERS AND TOOLS.

the fusing disk to prevent excessive local heat and change of shape in the work.

The United States is a large manufacturer of metal-working machinery, the exports under this specific title having increased from $3,716,-709 in 1904 to $14,011,359 in 1914.

Bibliography. A large number of books dealing with machine shops and tools are available, but in most cases the most recent practice will best be described in the current files of such journals as the *American Machinist* (New York), *Power* (ib.), *Machinery* (ib.), and *Journal of the American Society of Mechanical Engineers* (ib.); while the catalogues of the more important machine-tool makers can be studied with considerable profit. Also: L. E. Brookes,

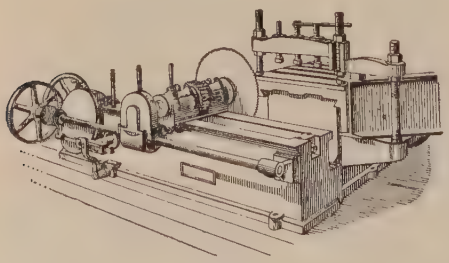


FIG. 8. COLD-METAL-SAWING MACHINE.

Twentieth Century Machine Shop Practice (Chicago, 1906); J. G. Horner, *Modern Milling Machines* (New York, 1906); id., *Practical Metal Turning* (ib., 1906); C. H. Benjamin, *Modern American Machine Tools* (ib., 1907); J. F. Hobart, *The Screw-Cutting Lathe* (ib., 1907); C. O. E. Perrigo, *Modern American Lathe Practice* (ib., 1907); Goodrich and Stanley, *Accurate Tool Work* (Chicago, 1908); S. H. Moore, *Mechanical Engineering and Machine Shop Practice* (ib., 1908); F. H. Colvin, *Engine Lathe Work* (New York, 1909); R. E. Flanders, *Gear Cutting Machinery* (ib., 1909); Goodrich and Stanley, *Automatic Screw Machines and their Tools* (Chicago, 1909); D. F. Nedden, *Engineering Workshop and Engineering Work and Processes* (New York, 1910); F. H. Colvin, *Machine Shop Mechanics* (ib., 1911); J. V. Woodworth, *American Tool Making and Interchangeable Manufacturing* (2d ed., ib., 1911); id., *Drop Forging, Die Sinking, and Machine Forming of Steel* (ib., 1911); Colvin and Stanley, *American Machinists' Handbook and Dictionary of Shop Terms* (ib., 1914).

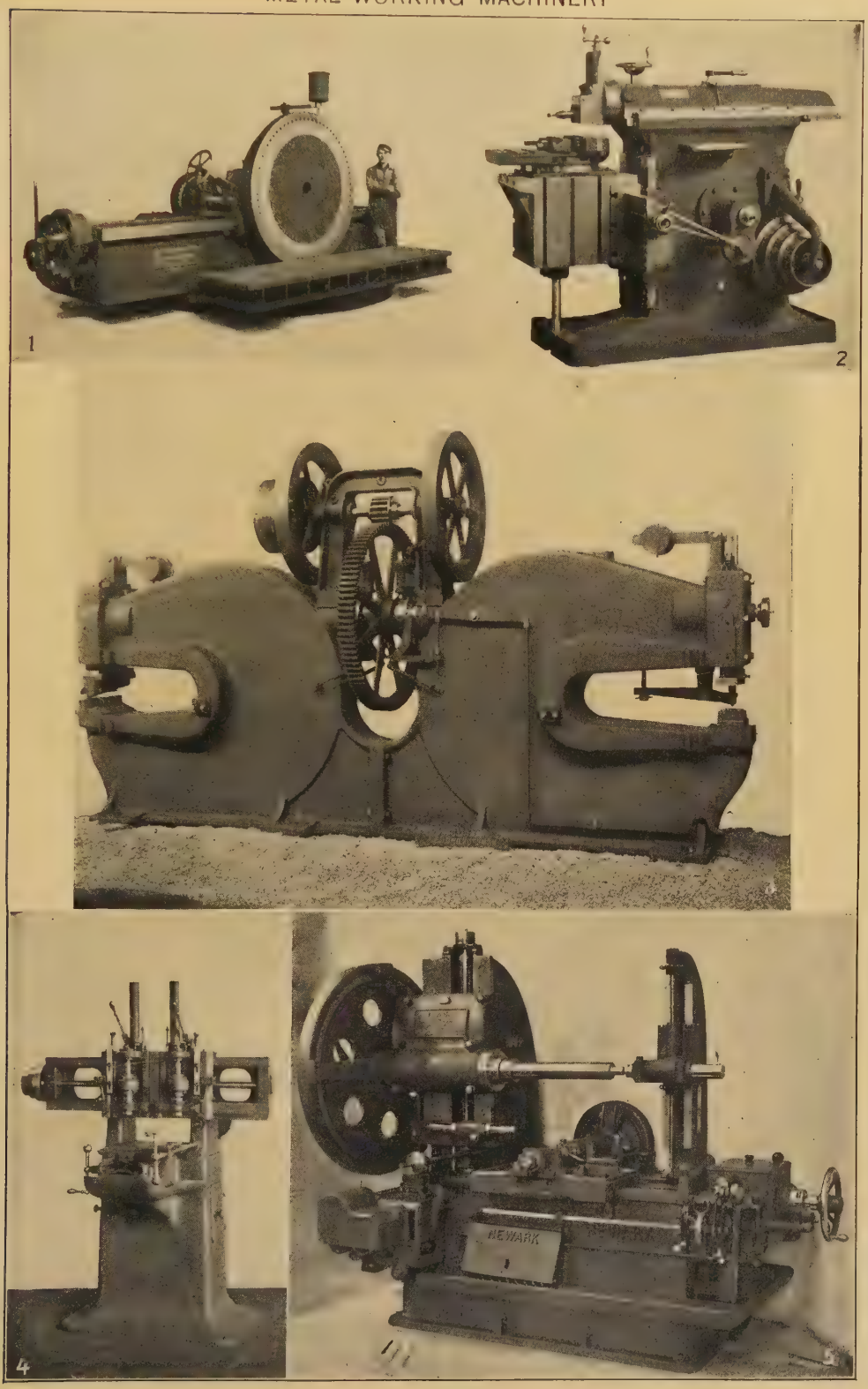
METAM'ERISM (from Gk. *μετά, meta,* after + *μέρος, meros,* part). In zoölogy a term equivalent to segmentation, as seen in the worms whose body is divided along the primary or longitudinal axis into segments, homologous with each other, which are technically called somites or metameres. Each metamere or segment contains a chamber or compartment of the body cavity and a section of the alimentary canal and other organs. The external appendages, or the so-called segmental organs, are said to be segmentally or metamerically arranged. Metamerism is most obviously exhibited in worms and arthropods, as the lobster, myriapods, and insects. Vertebrate animals, also, in the nervous system and some of the other organs, show a tendency to a repetition of segments, i.e., to metamerism.

METAM'NEH. A town of Galabat (q.v.).

METAMOR'PHIC ROCKS. One of the three great divisions of the rocks (see ROCK) characterized generally by a foliated or schistose structure and including: (1) rocks which have been shown to be altered (metamorphosed) igneous rocks (q.v.); (2) rocks which have been shown to be altered sedimentary rocks (q.v.); and (3) rocks which, while resembling one or both of these types, do not allow of a definite determination of their origin. This implies that the product of metamorphism acting upon a sedimentary rock may be indistinguishable from the result of the same agencies acting upon an igneous rock. There are, however, certain limits of composition fixed by the laws of consolidation of rock magmas that restrict somewhat the composition of metamorphic rocks which can have had an igneous origin, the processes of metamorphism having been shown in the great majority of instances not to have altered in an important way the ultimate composition of the rock as a whole. The metamorphic rocks are as a class those of which the processes involved in their alteration have been active within the crust of the earth, and are exclusive of those formed through the chemical action of the atmospheric agencies, the latter class being generally designated residual rocks (q.v.). See METAMORPHISM.

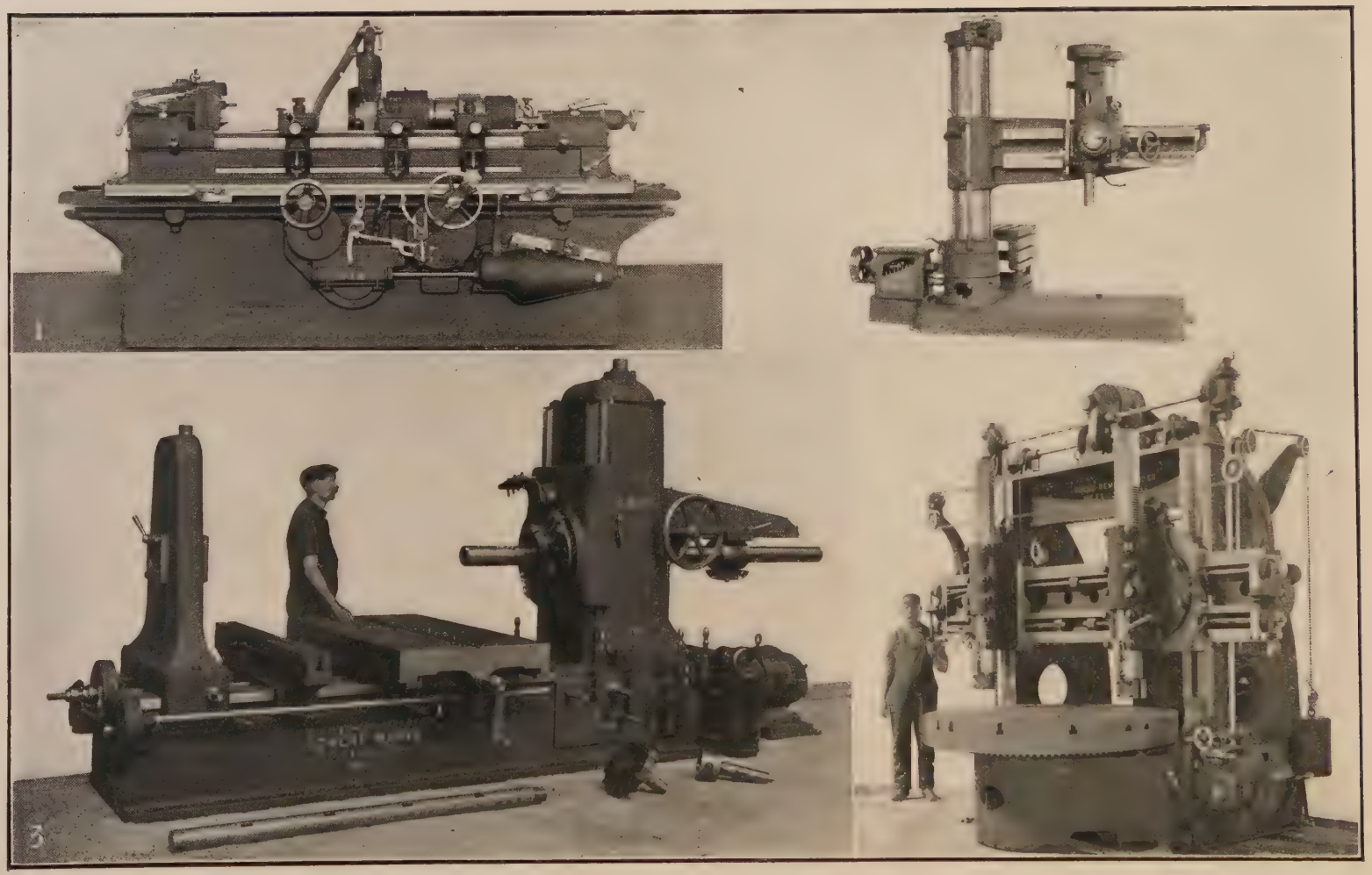
Metamorphic Sedimentary Rocks. The principal metamorphic sedimentary rocks are definitely related to the unaltered sedimentary rocks, principally, however, in respect to composition. Thus marble (q.v.) and crystalline limestone (q.v.) are metamorphosed limestone, and dolomitic marble is the product of metamorphism of dolomite. Quartzite (q.v.) and quartz schist result from the metamorphosis of arenaceous rocks, and by the recrystallization of

METAL WORKING MACHINERY



1. ROTARY PLANER OR END MILLING MACHINE
2. HEAVY DUTY 24-INCH BACK-GEARED PILLAR SHAPER
3. DOUBLE PUNCHING AND SHEARING MACHINE
4. TWO-SPINDLE PROFILING MACHINE
5. AUTOMATIC HEAVY PINION CUTTING MACHINE

METAL WORKING MACHINERY



1. A 14 X 50-INCH PLAIN GRINDING MACHINE
2. RADIAL DRILLING MACHINE
3. A 60-INCH MOTOR-DRIVEN DUPLEX BORER, DRILLER, AND MILLER
4. A 73-INCH BORING AND TURNING MILL, MOTOR-DRIVEN

contained iron ore or by the impregnation by ferruginous material they become jaspilite (q.v.) or hematite rock. The argillaceous rocks produced by the same processes are slate, phyllite, mica schist, hornblende or actinolite schist, garnetiferous schist, staurolitic schist, and the rarer types of hornfels or hornstones (q.v.), albite schist and chiastolite schist.

Metamorphic Igneous Rocks. The types included under this head may generally be recognized by the partial preservation of the peculiar textures of igneous rocks; such, e.g., as the granitic, porphyritic, vitreous or glassy, spherulitic, pearlitic, etc. (See IGNEOUS ROCKS.) These structures are, however, almost always obscured by the presence of parallel or approximately parallel sets of fissile planes which are collectively referred to as the schistosity of the rock. (See METAMORPHISM.) There may be several sets of these fissile planes, but when two or more are present it is generally impossible to determine whether the rock had an igneous or a sedimentary origin, and it would be relegated to the third class of metamorphic rocks. It has been found that igneous rocks which were originally glassy in texture are liable to devitrification, the product of which process is a rock of microcrystalline or cryptocrystalline texture. Metamorphic rocks of this derivation are named in terms of the rocks from which they have been derived with the addition of the prefix *apo;* as, e.g., aporhyolite, from rhyolite (q.v.). If, however, the induced texture is that of schistosity or foliation alone, a structure which must be referred to the processes known as dynamic metamorphism, the original name of the igneous type is joined to the textural term "gneiss"; as, e.g., *granite-gneiss* from metamorphism of granite (q.v.). *Granitoid gneiss* is the equivalent of granite-gneiss. The third class of metamorphic igneous rocks owe their origin chiefly to the chemical alteration (recrystallization) of igneous rock types with the abundant development of new minerals out of old ones. Such rocks are steatite or soapstone (q.v.), from the development of talc, and serpentine rock (q.v.), from the development of serpentine, in rocks of dominant magnesian composition.

Consult: Zirkel, *Lehrbuch der Petrographie,* vol. iii (Leipzig, 1894); Diller, "The Educational Series of Rock Specimens Collected and Distributed by the United States Geological Survey," in *United States Geological Survey, Bulletin 150* (Washington, 1898); Pirsson, *Rocks and Rock Minerals* (New York, 1908); Rosenbusch, *Elemente der Gesteinslehre* (Stuttgart, 1910).

MET'AMOR'PHISM. A term commonly used by geologists to indicate the profound changes which some rocks have undergone. It is particularly applicable to those modifications that are usually accompanied by an increase in hardness and degree of crystallization from the original conditions. Metamorphism may lead also to the mineralogical reconstruction of rocks. The changes which occur in the outer zone of the earth's crust as the result of weathering and hydration are embraced under the term "katamorphism." The metamorphic processes are characteristic of the deeper zone under the influences of heat and pressure. The phenomena of metamorphism are commonly met with in nature, particularly in the regions underlain by ancient rocks, where the processes of upheaval and subsidence and volcanic forces have operated through long periods of time. The degree to which rocks have been changed varies from mere hardening in some cases to an extreme marked by complete alteration in structure and composition.

Kinds of Metamorphism. Strata in the vicinity of igneous intrusions, as dikes and bosses of granite, are more or less metamorphosed and show an increase in hardness and crystallization. In this kind of metamorphism, called *contact metamorphism,* the amount of change effected depends upon the character of the invading rock and the rock that has been invaded, and also upon the proximity to the contact. Deep-seated igneous masses exert greater influence than surface flows of lava, doubtless because of the greater heat and longer period of cooling; while those of acid composition in which there are large quantities of occluded gases and vapors are more effective than basic types. The character of the strata invaded by the igneous rock largely determines the extent to which new minerals are formed; sandstone usually shows no change beyond a hardening or recrystallization of the quartz particles, but clay rocks, such as shales and slates, exhibit a complete rearrangement of the chemical constituents with the formation of new minerals. Limestones are also greatly changed along the contacts with igneous rocks, undergoing a crystallization so as to form marbles and developing new minerals by combination of the materials in the limestones with those given off by the igneous intrusions. In such contact zones valuable ore deposits may be present, especially deposits of copper, lead, and silver ores.

A second form of metamorphism by which rocks have been influenced over wide areas depends upon the energy developed by the great stresses and movements within the earth's crust; this is called *regional* or *dynamic metamorphism.* The first stages of regional metamorphism are indicated by hardening and the loss of volatile substances; but, as the strains of compression and shearing increase, the rock assumes a schistose structure and its constituent minerals are more or less completely recrystallized. The change effected may amount to a thorough transformation, as from an unaltered sediment to a homogeneous crystalline mass resembling an igneous rock. In most cases the influence of pressure in producing such metamorphism is manifest in the foliated or schistose structure which the rocks exhibit.

Causes of Metamorphism. Heat, pressure, and moisture are the most effective agencies in producing the changes known as metamorphism. The influence of heat is shown in igneous contacts, but it is also an accessory in regional metamorphism, although pressure is here the dominant factor. Moisture, which is present in all classes of rocks, assists in decomposing minerals and in the formation of new compounds. The phenomena of metamorphism have been imitated in an experimental way by subjecting specimens of various rocks to the influence of heat and pressure. Consult Archibald Geikie, *Text-Book of Geology* (London, 1903), and Johnston and Niggli, "The General Principles Underlying Metamorphic Processes," in *Journal of Geology,* vol. xxi (Chicago, 1914). See GEOLOGY; METAMORPHIC ROCKS.

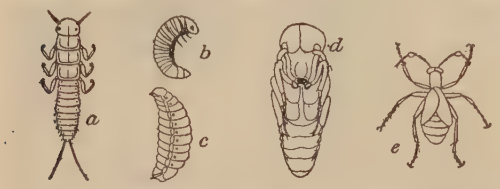
METAMORPHO'SES. The name of two famous Latin works, one in verse, by Ovid (q.v.), the other in prose, by Apuleius (q.v.).

MET'AMOR'PHOSIS (Lat., from Gk. μετα-

μόρφωσις, from μεταμορφοῦσθαι, *metamorphousthai*, to be transformed, from μετά, *meta*, a prepositional prefix often suggesting the idea of change, + μορφή, *morphē*, form). In the mythology of the ancients, those transformations of human beings into beasts, stones, trees, and even into fire, water, etc., in fables with which that mythology abounded. Writings dealing with such transformations were called metamorphoses (q.v.). See APULEIUS; OVID; FOLKLORE; WEREWOLF.

METAMORPHOSIS, IN ANIMALS. A change of form in the postembryonic life of an individual animal. The term is also applied to the change in form of homologous parts in different species.

The young of many animals pass through a series of changes of form, in each of which the animal is adapted to changes in its surroundings, involving alterations in its mode of life,



HYPERMETAMORPHOSIS OF OIL BEETLE.

a, first larva; *b*, second larva; *c*, third larva; *d*, pupa; *e*, mature beetle.

slight if the change of body form is slight, thoroughgoing and radical if its body becomes profoundly modified. As examples of a complete metamorphosis may be cited the life histories of the jellyfish (q.v.), the starfish, mollusks, crustaceans, insects, and also the salamanders, toads, and frogs. The result of this change of habits and form undoubtedly is to prevent the extinction of the species, since if at a given moment the parents were swept out of existence, the young, living under very different circumstances, would survive, develop, and represent the species. Again, in the marine species of worms, crustacea, etc., the free-swimming young (larvæ) are borne about by oceanic and tidal currents, and in this way what in adult life are the most sedentary forms become widely distributed from one part of the world to another. On the other hand, the larval forms of fixed marine animals serve as food for fishes, especially young fishes, and numerous invertebrates. Thus, were it not for the metamorphoses of animals, many species would become extinct sooner than they do, while the great overplus of larval forms gives to many other species of animals a secure hold on existence.

As an example of metamorphosis we may cite that of a butterfly. Its life is divided into four stages—the embryo passed within the egg, the larva, pupa or chrysalis, and imago. Such an insect after hatching lives, so to speak, three different lives, having distinct bodily structures and existing under very different conditions as regards food, enemies, etc. The caterpillar, e.g., has big jaws, which in the winged or adult state are entirely wanting or so modified that the mouth is a suctorial one. Other radical changes are observable in the body and appendages and also in the internal organs. The term "larva" (q.v.), as applied to the first stage of animals, is a very variable and indefinite one, that of insects in general being a much more highly organized animal than the larva of a worm, starfish, or crustacean. Primitive wingless insects (synaptera) do not pass through a metamorphosis. The metamorphosis of higher insects, whether winged or wingless, is of two sorts—complete and incomplete. The butterfly furnishes an example of complete metamorphosis. An example of incomplete metamorphosis is that of locusts or grasshoppers. In these insects the freshly hatched young differs from the adult only in being without wings. The different stages of metamorphosis are not primitive, inherited from some early form, but are acquired characters; the nauplius stage of most crustacea, and the caterpillar, maggot, or grub of insects, are forms which were adaptations to changed modes of life, inducing use or disuse of certain organs. At first insects were ametabolous and it was not until perhaps the middle of the Paleozoic era that insects with a metamorphosis began to exist.

Hypermetamorphosis. A condition in insects wherein they pass through more than the three normal stages. The best-known examples are the supernumerary stages of *Meloë*, *Stylops*, etc. In the oil beetle (*Meloë*) the freshly hatched young is an active, minute campodia-like larva, which is found on flowers. It crawls from these to the bodies of bees and is carried by them to their nests, where it feeds upon the bee eggs. This sedentary mode of life reacts upon the organism, and after molting in the second larval stage it is grublike, the body thick, soft, and fleshy (carabidoid stage), and it feeds on honey. At the next molt the insect is motionless and nearly footless (semipupal stage). It then changes to a third larval form, when it resembles the maggot or larva of a bee. It then transforms into a genuine pupa, and finally into the beetle.

Suppressed Metamorphosis. This phenomenon, or direct development, is a curtailment or absolute loss of primitive larval characters, or a forcing back of larval features or structures, until they are either passed through in the embryo before hatching or entirely lost, due to the lapse of heredity. This abbreviated metamorphosis is seen in the Crustacea, as the lobster (q.v.), and more especially in certain shrimps and crabs, which, owing to changed conditions, hatch in the adult form, passing through the nauplius and zoëa stages in the embryo. It is also seen in the frogs (see FROG), where the different degrees of metamorphosis are quite plainly due to great differences in the conditions of life. See NIDIFICATION.

Causes of Metamorphosis. These are obscure, but it is plain that the different stages are exaggerated or pronounced periods in the growth of the animal, and that the fundamental causes are the same as those which have initiated and controlled the origin of species. This is plainly seen in aquatic larvæ, the young of forms whose larvæ were originally terrestrial. The numberless contrivances and temporary larval organs, especially seen in dipterous larvæ, are evidently adaptations to the needs of the insect during its temporary aquatic life, these being cast aside when the animals pass to a different medium.

Bibliography. Sir John Lubbock, *The Metamorphoses of Insects* (London, 1874); Balfour, *Treatise on Comparative Embryology* (ib., 1880–81); Korschelt and Heider, *Text-Book of the Embryology of Invertebrates* (ib., 1895–1900); Packard, *Text-Book of Entomology* (New York,

1898); J. W. Folsom, *Entomology* (Philadelphia, 1906); Parker and Haswell, *Text-Book of Zoölogy* (new ed., London, 1910).

METAMORPHOSIS, IN PLANTS. Goethe's doctrine which seeks to establish a relationship between the different organs of a plant by assuming an ideal fundamental organ from which the different leaf organs could be derived. The stem came into consideration only as carrying leaves, and the root was almost entirely disregarded. In its application this ideal leaf form came to mean to most botanists an ordinary foliage leaf, and foliar structures have been in the main presented from this standpoint. For example, the parts of the flower are commonly spoken of as modified or metamorphosed leaves; and when petals or stamens are abnormally replaced by foliage-like structures, they are said to revert to the primitive condition and to prove derivation from leaves by modification. Morphology long ago disproved this idealistic metamorphosis, and it does not regard the occasional replacement of a usual organ by an unusual one as any argument in favor of such a view. Consult Sachs, *History of Botany, 1530–1860*, translated by Garnsey and revised by Balfour (Oxford, 1906).

METAPH'ONY. See ETYMOLOGY, FIGURES OF.

MET'APHOR (Gk. *μεταφορά, metaphora*, a transference). A figure of speech by means of which one thing is put for another which it only resembles. Thus, the Psalmist speaks of God's law as being "a lamp unto his feet and a light unto his path." The metaphor is a kind of comparison in which the speaker or writer, casting aside the circumlocution of the ordinary similitude, seeks to attain his end at once by boldly identifying his illustration with the thing illustrated.

MET'APHYS'ICS (Lat. *metaphysica*, from Gk. *μετὰ τὰ φυσικά, meta ta physika*, following the physics, because of the position this subject occupied in Aristotle's collected works). The name given to the science which deals with ultimate reality. Metaphysics or ontology is a term used to designate a branch of philosophy, but much difference of opinion prevails as to the precise character and function of this philosophic discipline and even as to its possibility. Before Kant's time there was a very general tendency to build up theories of the nature of things on the basis of a priori reasoning. Certain metaphysical principles were assumed to be necessary, and the acceptance of these principles led to the deduction of various propositions which were held true of reality as it is in itself, i.e., of reality as it exists without relation to the conditions of our experience. This method of procedure is called dogmatism (q.v.), and the metaphysics thus developed is dogmatic or rationalistic metaphysics. This may be dualistic, as in the case of Descartes, who maintained the radical difference between mind and body as two disparate substances; or it may be qualitatively monistic, as in the case of Leibnitz, who resolved all reality into spiritual monads (spiritualistic or idealistic monadism), and in the case of Hobbes, who supposed that all reality consisted in matter and motion (materialism). Others held that knowledge of reality is not derived from a priori principles, but is obtained only from experience, and that this experience gives us a true view of reality. The type of metaphysics thus developed is called empiricism (q.v.). Still others maintained that, while there is an ultimate reality, it is inaccessible to human knowledge, which is conditioned by human faculties; these faculties do not present us with the real as it is in itself, but with the results of their own elaboration. Our sensations are not revelatory, but transformative, and the results they give us vary with the varying individuals and their varying pathological conditions. Knowledge is thus only seeming; it is illusory. This view is called skepticism. Kant (q.v.) combined and compromised these different motives, and as a result developed a philosophy which he called criticism and transcendentalism. This was skeptical in that it held that there can be no knowledge of ultimate reality. It was empiristic in that it maintained that all knowledge arises with experience and is true of objects of actual and possible experience. It is dogmatic in that it maintained the a priori character of the principles of this empirical knowledge. These principles are necessary and universal in their application to experience; the reason for this is that there are forms supplied by the mind to its sensations, and these forms are logically prior to experience. This logical priority is their transcendentality, because these principles transcend experience in the same way in which any condition transcends what it conditions; the transcendental reaches beyond any actual experience and extends to all possible experience. But while controlling all experience, both actual and possible, these principles are powerless with regard to things in themselves. They are not, therefore, to be treated as if the necessary knowledge they confer were a revelation of things as they are in themselves. This knowledge concerns things only "in so far as they appear to us." The argument whereby Kant tried to establish this limitation of knowledge to experience, actual and possible, and to demonstrate its inability to penetrate beyond experience to the realm of the ultimately real, constitutes the critical feature of his philosophy, giving the key word to the title of his three leading treatises, which are all *Critiques* (*Kritiken*).

These types of metaphysics found in modern philosophy up to and including Kant are therefore dogmatism (in its monistic and dualistic varieties and spiritualistic and materialistic subvarieties of the former), empiricism, skepticism, and critical transcendentalism. Some of Kant's most distinguished followers (Fichte, Schelling, and Hegel) developed his transcendentalism and dropped his criticism. This they were enabled to do by their denial of any meaning to the Kantian conception of things in themselves. We have thus a dogmatic transcendentalism in opposition to critical transcendentalism. Since the great period of this dogmatic transcendentalism, extending for about 40 years, to the end of the third decade of the nineteenth century, the development of metaphysics has resulted in as many types as were presented in pre-Kantian philosophy, in spite of Kant's assurance that he had forever determined the limits of philosophical speculation. Materialism revived about the middle of the century; empiricism reasserted itself and in recent years has advanced to the position designated radical empiricism. (See EMPIRICISM and JAMES, WILLIAM.) Dogmatism has challenged Kant's veto. Skepticism, especially in the form of phenomenalism, has had active supporters. (See COMTE and SPENCER.) Both critical and dogmatic transcendentalism have been vigorously upheld

in the Neo-Kantian and Neo-Hegelian movements. In addition some new forms of metaphysics have appeared on the scene. The new realism has combined various motives more or less allied to those actuating other schools. In voluntarism (q.v.) there has been a significant modification of the older idealism in that for this metaphysics ultimate reality is given the character of will rather than that of intellect. See SCHOPENHAUER; BERGSON; MÜNSTERBERG.

Bibliography. The bibliography of metaphysics is almost coextensive with that of philosophy itself. Consult, for the modern period, the works of Descartes, Spinoza, Leibnitz, Hobbes, Locke, Berkeley, Hume, Kant, Fichte, Schelling, Hegel, Büchner, Comte, Schopenhauer, Lotze, Green, J. and E. Caird, Harris, Royce, Taylor, James, Dewey, Bergson, Russell. Systematic treatises: Paul Deussen, *Elemente der Metaphysik* (Aix-la-Chapelle, 1877; 3d ed., Leipzig, 1902; Eng. trans., London, 1894); R. H. Lotze, "Metaphysik," in his *System der Philosophie*, part ii (Leipzig, 1879; Eng. trans., 2d ed., 2 vols., Oxford, 1884–87); Karl Dietrich, *Grundzüge der Metaphysik* (Freiburg, 1885); B. P. Bowne, *Metaphysics* (2d ed., New York, 1895); G. T. Ladd, *A Theory of Reality* (ib., 1899); F. H. Bradley, *Appearance and Reality* (2d ed., ib., 1902). For a general survey of the field, consult: Friedrich Paulsen, *Introduction to Philosophy*, translated by Frank Thilly (2d Amer. from 3d Ger. ed., New York, 1895); Arnold Külpe, *Introduction to Philosophy* (Eng. trans., London, 1897); Rerouvier, *Histoire et solution des problèmes Métaphysique* (Paris, 1901); J. S. MacKenzie, *Outlines of Metaphysics* (London, 1902); G. S. Fullerton, *A System of Metaphysics* (New York, 1904); Harald Höffding, *Problem of Philosophy* (Eng. trans., ib., 1905); James Lindsay, *Fundamental Problems* (Edinburgh, 1910); William Jerusalem, *Introduction to Philosophy* (Eng. trans., New York, 1910); M. W. Calkins, *Persistent Problems of Philosophy* (3d ed., ib., 1912). See also PHILOSOPHY and the references there given.

MET'APON'TUM, or **METAPONTIUM** (Lat., from Gk. Μεταπόντιον, *Metapontion*). An ancient city of Magna Græcia, Italy, 24 miles from Tarentum and 14 from Heraclea. It was founded at the instigation of the Sybarites, who wished to check the advance of Tarentum, by Achæan and probably Messenian emigrants, early in the seventh century B.C. To this place the philosopher Pythagoras was said to have retired, and here his tomb was shown. In 415 B.C. we find the inhabitants allies of the Athenians in their invasion of Sicily, and for some time previous the town had evidently been in a condition of constantly increasing prosperity. In the wars waged against Rome by Pyrrhus and Hannibal the Metapontines were hostile to the Imperial city. At the end of the war of Pyrrhus they were subjugated completely by the Romans, but in 212 B.C. succeeded in throwing off the yoke by admitting the Carthaginians. After the withdrawal of the Carthaginians the city was deserted and soon fell into ruin. In the neighborhood of the modern railway station are some remains of ancient temples, and excavation has brought to light some inscriptions and architectural fragments. Consult Lacava, *Topografia e storia di Metaponto* (Naples, 1891).

METASOMATISM, mĕt'ā-sō'mā-tĭz'm. A term used in geology for those processes of chemical reaction that lead to the replacement of one mineral by another of different composition. The chemical reaction is incident usually to a change of environment whereby the mineral becomes less stable than under its original surroundings. A chemical rearrangement then takes place, or an entirely new compound may be introduced, the nature of which is determined by the special conditions. In any case the process seems to be one of molecular interchange, the old being replaced molecule for molecule by the new compound. The latter may contain some of the elements of the earlier mineral, as in the change of tremolite (an anhydrous silicate of lime and magnesia) to talc (hydrous silicate of magnesia), or it may be wholly different, as is shown in the replacement of calcite by metallic sulphides. The underground waters and the heated waters and vapors given off by igneous rocks during the process of consolidation are effective agencies in metasomatism, which is of great importance in the formation of ore deposits.

METASTASIO, mā'tā-stä'zē-ō (originally TRAPASSI), PIETRO (1698–1782). A great Italian poet and dramatist. He was born at Rome, Jan. 13, 1698, of humble parents, and gave early evidence of his genius by his boyish improvisations. Gravina, a famous jurisconsult of the day, believing in the youth's genius, took charge of his education and gave his paternal name of Trapassi the Greek form Metastasio. He forbade his wasting his powers in improvisations, gave him severe training in the Greek and Latin classics, and left him an inheritance which Metastasio soon dissipated. In Naples, where he had gone in hopes of a livelihood, he wrote the *Orti Esperidi* (1721), the performance of which aroused the general enthusiasm, particularly that of the famous singer Marianna Bulgarelli, who had the pleasing youth come to live in her house. His frequent meetings there with the composer Porpora gave him the intimate knowledge of musical composition for which his subsequent dramas, all written to be sung, are remarkable. In 1724 appeared one of his most celebrated dramas, *Didone abbandonata*, which, with *Catone* and *Siroe*, gave the poet a European name. In 1730 Metastasio accepted the post of court poet at Vienna. While there he composed 11 plays, among which are his *Ciro*, *Demofoonte*, and *Temistocle*. Among the best of his melodramas are *Clemenza di Tito* (1734) and *Attilio Regolo*, this latter being usually considered his masterpiece. He died at Vienna, April 12, 1782, having continued Zeno's work in raising melodrama from the low state to which it had fallen and given it in many respects its most perfect expression. His themes have a humorous color under a varnish of nobility and his characters possess a recognizable psychology; his expression is simple and harmonious and the skill with which he balanced words and music is unsurpassed. Some of his airs have become part of the permanent stock of Italian folk songs. The sentimentality and artificiality with which he was vigorously charged, especially by the more serious writers of the following generation, are characteristic of the Arcadian atmosphere in which he wrote. His works have been translated into many languages and set to music by celebrated composers, among them Vinci and Caldara, Pergolese and Scarlatti. The best edition of Metastasio is that of Paris (12 vols., 1780), with useful supplements in the *Opere postume* (Vienna, 1795), and in the Florentine

editions of 1820 and 1826. The latest critical edition is that published at Bari, 1914. Consult: Mussafia, *Pietro Metastasio* (Vienna, 1882); Giuseppe Carducci, *Lettere disperse e inedite di Pietro Metastasio* (Bologna, 1883); Masi, "Pietro Metastasio," in his *Parrucche e Sanculotti nel secolo XVIII* (Milan, 1886); Antona-Traversi, *Lettere inedite e disperse di Pietro Metastasio, con un' appendice* (Rome, 1886); O. Tommasini, "Pietro Metastasio e lo svolgimento del melodramma italiano," in his *Scritti di storia e critica* (ib., 1891); Vernon Lee, *Studies of the Eighteenth Century in Italy* (new ed., Chicago, 1908).

METAS'TASIS (Neo-Lat., from Gk. *μετάστασις*, removal, change, from *μεθιστάναι*, *methistanai* to remove, change place, from *μετά*, *meta*, after + *ἱστάναι*, *histanai*, to place, stand). A change in the seat of a disease from one part of the body to another. Acute infections of the venous channels are most likely to result in metastatic processes in other parts of the body. In thrombosis of the lateral sinuses following mastoiditis, portions of the clot may break off and be carried by the blood stream to the brain, heart, lungs or joints, ending respectively in abscesses, endocarditis or pericarditis, infarction and arthritis. The same series of events may attend septic infection of the uterus. When the blood stream becomes loaded with pus-producing organisms and multiple foci of infection are scattered throughout the body, the condition is known as *pyœmia* (q.v.). The wandering propensity of acute articular rheumatism and its tendency to involve the serous lining of the heart and pericardium are sometimes considered as an illustration of metastasis. This would lend support to the infectious theory of rheumatism and to the belief held by many that there is a focus of infection in the tonsils from which bacteria are carried to the joints and the heart. In mumps (q.v.) metastasis may take place in the ovaries in girls or in the testicles in boys, with resulting ovaritis or orchitis respectively. In cancer metastasis takes place principally through the lymphatics, but it is probable that the blood stream may also be implicated, since the foci are often widely distributed.

ME'TA SU'DANS (Lat., dripping cone). A great fountain facing the Coliseum at Rome, said to have been erected by Domitian and completed in 97 A.D. Representations on medals and references in literature, however, seem to indicate that Domitian enlarged a fountain already in existence. Its name was given from its shape, which represented the conical turning post of a Roman circus, and from the way the water flowed out through openings over the cone. Only the partially restored brick interior of the fountain remains.

METATARSALGIA, mĕt'ȧ-tär-săl'jĭ-ȧ (MORTON'S DISEASE). A severe neuralgic pain beginning in the ball of the foot and extending up into the foot and leg. It is caused by pressure upon the nerves running between the distal ends of the metatarsal bones, usually the third and fourth, and is set up either by tight shoes, bony hypertrophy of the distal end of the bones, or weakness of the external arch of the foot. The treatment in extreme cases may require resection of the head of the bone or excision of the superficial branch of the external plantar nerve; but relief may generally be obtained from the wearing of properly fitting shoes and appropriate flat-foot braces. Temporary relief may be had by injecting the nerve concerned with cocaine or normal saline solution.

MET'ATHE'RIA (Neo-Lat. nom. pl., from Gk. *μετά*, *meta*, after + *θηρίον*, *thērion*, dim. of *θήρ*, *thēr*, wild beast). The order Marsupialia, or marsupial mammals. In the classification of the Mammalia prepared by Huxley (*Proceedings of the Zoölogical Society of London*, 1880) the marsupials were placed in a class Metatheria (compare DIDELPHIA), between the Prototheria, or monotremes, below them, and the Eutheria, or ordinary mammals, above them, and equivalent to both in rank. He enumerated 11 characters in distinguishing the Metatheria and giving it the rank he proposed. Subsequent investigations, however, have shown the invalidity of some of the supposed facts relied upon, and the preponderance of evidence that the marsupials cannot be separated from the higher mammals by any such gap as separates them from the Prototheria. The term "Metatheria" is now retained by several authors as the designation of a section of the subclass Eutheria embracing the marsupials. Gregory employs it as the first of two infraclasses (the second being Eutheria), forming the subclass Theria. Consult Beddard, *Mammalia* (London, 1902), and W. K. Gregory, "The Orders of Mammals," in *Bulletin, American Museum of Natural History*, vol. xxvii (New York, 1910).

METATH'ESIS. See ETYMOLOGY, FIGURES OF.

METAURUS, mē-tą'rŭs (It. *Metauro*). A small river of central Italy, emptying into the Adriatic, 4 miles south of Fano. It was the scene of the defeat of Hasdrubal, brother of Hannibal, by Caius Nero and Marcus Livius in 207 B.C.

METAXYLEM, mĕt'ȧ-zī'lĕm. A term used in the vascular anatomy of plants. In the development of a xylem strand the group of elements which first appears is called the protoxylem (q.v.), while those which appear later constitute the metaxylem. Protoxylem and metaxylem together constitute the "primary wood," while the xylem produced by the cambium (q.v.) is "secondary wood."

MÉTAYER, mȧ'tȧ'yȧ' (Fr. *métayer*, farmer who tills the land for half the produce). An agricultural tenant who works the land with capital owned by the landlord and pays as rental a fixed proportion of the crop. It may in general be said to be the resource of a community where cultivators are without capital. In the United States such a system of renting land on shares prevails mainly in the South, but as time progresses money rents are substituted more and more for share rents, and this seems to be the natural tendency where the economic position of the tenants improves. The system of métayage is still very common in Italy, parts of Austria and Russia, and in Portugal and the West Indies. Métayage is a system which possesses marked social advantages but equally marked economic disadvantages. The métayer cannot be rack-rented; bad seasons cannot drive him into bankruptcy; the increase in value of produce due to improved means of transportation redound to his advantage as well as to that of the landlord. Métayage, therefore, tends to create a class of peasantry who are in large measure independent of the price movements which are so great a source of anxiety to the small farmer who is compelled to make periodic money payments for rent. But, on the other

hand, there is slight inducement for either métayer or landowner to make improvements, since one-half of the resulting increase in product goes to the other party on the division of the crop. Métayage has for this reason tended to perpetuate primitive conditions of agriculture. This evil is, however, not necessarily inherent in the system, since it would be quite possible for landowner and métayer to unite in making improvements, and this practice is not uncommon in France. It is also possible to make an agreement as to a separate return for the capital invested. The economic disadvantages of divided responsibility would still remain, and for this reason métayage can hardly survive in highly advanced economic conditions. Its existence in so large a part of Europe is probably to be explained by the persistency of custom among the agricultural population. See Cruveilhier, *Etude sur le métayage* (Paris, 1894). An excellent account of the system in practice is to be found in Higgs, "Métayage in Western France," in *Economic Journal* (March, 1894). See also articles on "Métayage" in Palgrave, *Dictionary of Political Economy*. The standard works on political economy usually devote some attention to the merits of métayage. Consult Adam Smith, *Wealth of Nations* (London, 1776; new ed., New York, 1904), and J. S. Mill, *Principles of Political Economy* (London, 1848; new ed., New York, 1909).

MET'AZO'A (Neo-Lat. nom. pl., from Gk. *μετά, meta,* after + *ζῷον, zōon,* animal). The name applied to all the animals above the Protozoa. The animal kingdom is thus subdivided into two divisions, viz., the Protozoa, or one-celled animals, and the Metazoa, or many-celled animals. The latter include all the branches or phyla of the animal kingdom from the sponges (Porifera) to the Vertebrata. Each metazoan, however, develops from a single cell, the egg.

The Metazoa have been defined as "animals in which the ordinary (so-called adult) form of the species has always more than one nucleus, and in which the nuclei are for the most part arranged regularly and with a definite relation to the functional tissues of the animal (so-called 'cellular arrangement'). Special conjugating individuals of the form of ova and spermatozoa are always formed." Metazoa reproduce by ova and spermatozoa. These reproductive products originate by a process of unequal fission from their parent, and may be produced by one or different individuals. When they are both produced by the same individual that individual is said to be *hermaphrodite.* When they are produced by different individuals, that parent giving rise to the egg is called *female* and that producing sperm cells or spermatozoa is called the *male,* and the individuals are said to be unisexual and the species diœcious. In certain forms, probably under given conditions of food or temperature, the ova may develop without being fertilized by a sperm cell, the process being called parthenogenesis (q.v.). Reproduction by ova and spermatozoa is called sexual reproduction, and that by parthenogenesis asexual reproduction. Consult Bourne, *The Cœlomate Metazoa* (New York, 1901). See CLASSIFICATION OF ANIMALS.

MET'CALF, WILLARD LEROY (1858–). An American landscape painter. He was born in Lowell, Mass., and was at first apprenticed to a wood engraver. He studied painting under George L. Brown (1876–77), at the Boston Art School, and in Paris (1883) under Boulanger and Lefebvre. On his return to the United States he established himself in New York. Metcalf came to be recognized as one of the foremost American landscape painters of his day. He was elected a member of the National Institute of Arts and Letters, became one of the "Ten American Painters," and received many medals and prizes. His art is characterized by a delicate restraint and a fine feeling for values and tone. His landscapes have a lyric quality, and though seldom brilliant in execution, are nevertheless satisfying in their quiet appeal. He is represented by "May Pastoral" in the Boston Museum of Fine Arts; "The Family of Birches," National Gallery, Washington; "Twin Birches," Pennsylvania Academy of Fine Arts, Philadelphia; "May Night," Corcoran Gallery, Washington; "Icebound," Art Institute, Chicago; "On the River," Cincinnati Museum; "The Prelude," Worcester Museum; "Unfolding Buds," Detroit Museum.

METCALF, WILLIAM (1838–1909). An American steel manufacturer. Born at Pittsburgh, Pa., he graduated from Rensselaer Polytechnic Institute, Troy, N. Y., in 1858. In 1860–65 he had charge of the manufacture of the heavy Rodman and Dahlgren guns at Fort Pitt foundry, Pittsburgh, where most of the heavy artillery used by the Federal government during the Civil War was made. After 1868 he was engaged continuously in steel manufacturing, and in 1897 he organized the Braeburn Steel Company, of which he was the head until his death. He is credited with having made the first crucible steel in America. In 1881 he served as president of the American Institute of Mining Engineers and in 1893 he held the presidency of the American Society of Civil Engineers. He published *Steel—A Manual for Steel-Users* (1896).

METCALFE, CHARLES THEOPHILUS, BARON (1785–1846). A British statesman, born in Calcutta, India. At an early age he was sent to England, where he was educated in a preparatory school at Bromley, and then at Eton. After holding various other positions he became a member of the Supreme Council of India in 1827, and from 1835 to 1836 was provisional Governor-General. During his short term of office he made certain the freedom of the Indian press. He was next made Lieutenant Governor of the Northwest Provinces, but resigned in 1838 and returned to England. The next year he was sent out as Governor of Jamaica, where he succeeded in bringing about better relations between the planters and the emancipated blacks. In 1842 he returned to England, and the next year was made Governor-General of Canada, where he soon came into conflict with the Executive Council and the Representative Assembly. This Council (or cabinet) had been elected to carry into effect the principles of responsible or parliamentary government. In consequence of his refusal to admit their right to be consulted about official appointments—a cardinal feature of the new system—all the members of the Council save one resigned, and for some time he was without a full Council. His refusal occasioned a prolonged and bitter controversy between the Reform and Conservative leaders. The books and pamphlets published for and against him, and his attitude were notably strong and brilliant. In the election of November, 1844, the government received a small majority, and

he was able to fill the vacancies with men of his own views. In 1845 he was created Baron Metcalfe of Fern Hill, but in the same year an incurable disease forced him to return to England, where he died. Metcalfe, who had many admirable personal qualities, had been trained in a political school ill adapted to the demands of Canadian politics. In India and Jamaica his point of view had been that of a benevolent autocrat. He lacked both the temper and the knowledge necessary to apply to a vigorous democracy a principle newly vindicated by long and severe party struggle. Consult Sir J. W. Kaye, *Life and Correspondence of Charles, Lord Metcalfe* (rev. ed., London, 1858).

METCALFE, Frederick (1815–85). An English scholar and educator. He graduated at St. John's College, Cambridge, in 1838, and was elected fellow of Lincoln College, Oxford. In 1848 he became head master of Brighton College, and then he returned to Lincoln College, where he became bursar in 1849, subrector in 1851, and Greek lecturer in 1853. In 1844 he published a translation of Prof. W. A. Bekker's *Gallus*, with notes and excursus, considered of great historical value (2d ed., 1853). In 1845 followed his translation of Bekker's *Charicles*, a story similarly illustrative of private life among the ancient Greeks, also with notes and excursus. He published: *The Oxonian in Norway* (1856); *History of German Literature* (1858); *The Oxonian in Iceland* (1861); *The Englishman and the Scandinavian* (1880).

METCALFE, Samuel L. (1798–1856). An American physician and scientist. He was born near Winchester, Va., graduated M.D. at Transylvania University in 1823, practiced in New Albany, Ind., and in 1831 went to England. Returning to the United States, he made a geological trip through eastern Tennessee, North Carolina, and Virginia, and then settled in New York City, where he devoted himself to scientific work and contributed to the *Knickerbocker Magazine* over the initial M. In 1835 he again visited England. He is the author of *Narratives of Indian Warfare in the West* (1821); *A New Theory of Terrestrial Magnetism* (1833); *Caloric: Its Mechanical, Chemical, and Vital Agencies in the Phenomena of Nature* (2 vols., 1843; 2d ed., 1859).

METCHNIKOFF, mĕch'nĭ-kŏf, Elie (Iliya) (1845–1916). A biologist, born in the Province of Kharkov, Russia, May 15, 1845. He was educated at Kharkov and afterward studied at Giessen, at Göttingen, and at Munich. He was appointed to the chair of zoölogy at Odessa in 1870, but resigned in 1882 to devote himself to private researches. He traveled extensively, especially through the northern Balkan kingdoms and the Volga steppe. In 1884, as the result of work on sponges and polyps, he published an epoch-making memoir on the intracellular digestion of invertebrates, *Untersuchungen über die intracelluläre Verdauung bei wirbellosen Thieren* (1883). He found that the individual cells of sponges took in solid particles of food and digested them in order to provide material for the growth of the young; and he saw the amœba-like eggs of a polyp (*Tubularia*) eat and digest the neighboring follicular cells. He also established the fact that certain wandering amœboid cells attack, ingest, or absorb parts of the body which become either useless or septic and thus harmful to the organism, and even hard objects, as also microbes or disease germs and the bacteria which have entered a wound. He called these microbe eaters "phagocytes" (q.v.). (*Ueber die Beziehung der Phagocyten zu Milzbrandbacillen*, 1884.) He boldly (1884) threw out the remarkable theory (phagocytosis) that inflammation in the vertebrates is due to the struggle between the white or amœboid corpuscles of the blood and the disease germs within it. This theory, in the hands of Sir Almroth Wright (q.v.) and others, led to vaccinotherapy (q.v.). Metchnikoff went to Paris, becoming a French citizen, and was appointed chef de service in the Pasteur Institute in 1892, and later became subdirector, under Roux. In 1895 he demonstrated that bacteriolysis (Pfeiffer's phenomenon) can take place *in vitro*. (See Pfeiffer, Richard.) He paid special attention to the microscopy of syphilis (with Roux and others) and proved that the higher apes can be inoculated with this disease. Attributing many ailments of man and especially the decadence of old age to intestinal putrefaction, he made experiments with the intestinal flora and published *La vieillesse* (1904). He based his theory upon his observation of the therapeutic value of lactic ferments (*Bacillus bulgaricus*), not only as a preventive of, but also as a remedy in, intestinal putrefaction and autointoxication, thus bringing bacteriology to the assistance of therapeutics. In this connection he wrote *Quelques remarques sur le lait aigri* (1906). Later he took up the study of typhoid fever. Metchnikoff demonstrated the value of, and the close relation between, studies in the development of the lower animals and physiological and medical studies and practice. In 1908 he was awarded, with Paul Ehrlich, the Nobel prize for medicine. His chief writings, besides those mentioned, include: *Leçons sur la pathologie comparée de l'inflammation* (1892; Eng. trans., *Lectures on the Comparative Pathology of Inflammation*, London, 1893); *L'Immunité dans les maladies infectieuses* (1901; Eng. trans., *Immunity in Infective Diseases*, New York, 1905); *Etude sur la nature humaine: essai de philosophie optimiste* (1903). Three of his lectures were published in English as *The New Hygiene* (Chicago, 1907); and of his *Essais optimistes*, collected in 1907, two have appeared in translation as *The Nature of Man* (New York, 1903, 1908, 1910) and *The Prolongation of Life* (New York, 1908, 1910). Many of his essays which have not been included in this list appeared in *Annales de l'Institut Pasteur* (Paris). He also edited with Sacquépée and others *Médicaments microbiens, etc.* (1909). Consult E. E. Slosson, *Major Prophets of Today* (Boston, 1914).

METEL'LUS. The name of a Roman family of the plebeian gens Cæcilia, which rose to be one of the first families of the Roman nobility. 1. Lucius Cæcilius Metellus, consul in 251 B.C., victor, at Panormus, over Hasdrubal, 1 (q.v.). A tradition, questioned now, said that, in 241, when the temple of Vesta was burned, he brought out the Palladium safely, though he was himself blinded by the flames. Consult J. B. Mayor on Juvenal, 3, 139.—2. One of the most distinguished members of the family was Quintus Cæcilius Metellus Macedonicus, who received his surname from his victory over Andriscus, a claimant to the throne of Macedonia (148 B.C.). His life was considered by ancient writers an example of the greatest felicity. He died 115 B.C.—3. Quintus Cæ-

CILIUS METELLUS NUMIDICUS twice defeated Jugurtha in Numidia (108 B.C.), but was superseded in his command by Marius. When Saturninus caused a law to be passed requiring all senators to swear within five days to uphold his agrarian law, Metellus refused and went to Asia into exile. He returned later and died in Rome (c.91 B.C.). He was celebrated for his integrity. 4. His son, QUINTUS CÆCILIUS METELLUS, surnamed PIUS for his efforts to effect the recall of his father from exile, joined Sulla in 83 B.C., but sought to moderate the severity of his proscriptions. He fought with success for Sulla against Marius and served acceptably in Spain. He, too, bore a distinguished character for virtue.—5. QUINTUS CÆCILIUS METELLUS CRETICUS conquered Crete and reduced it to a Roman province (67 B.C.).—6. QUINTUS CÆCILIUS METELLUS PIUS SCIPIO, sometimes called QUINTUS SCIPIO and sometimes SCIPIO METELLUS, was a son of Publius Cornelius Scipio, who was adopted by one of the Metelli and became the father-in-law of Pompey (52 B.C.) and his zealous partisan. He commanded under him at Pharsalus, maintained war on his behalf for some time in Africa, and after the battle of Thapsus (46 B.C.) died by his own hand. Consult: M. Wende, *De Cæciliis Metellis* (Bonn, 1875); the article "Cæcilius," by F. Münzer, in Pauly-Wissowa, *Real-Encyclopädie der klassischen Altertumswissenschaft*, vol. iii (Stuttgart, 1897); and the article "Cæcilius" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

METEM'PSYCHO'SIS (Lat., from Gk. *μετεμψύχωσις*, from *μετεμψυχοῦν*, *metempsychoun*, to make the soul pass from one body to another, from *μέτα*, *meta*, over + *ἐμψυχοῦν*, *empsychoun*, to animate, from *ἔμψυχος*, *empsychos*, animate, from *ἐν*, *en*, in + *ψυχή*, *psychē*, soul). Transmigration of souls, or, more accurately, the reincorporation of a soul. In a crude form this is a frequent belief of primitive forms of religion, and is not a religious but a philosophical opinion. That is to say, it is not believed that any religious factors, such as the state of the soul or the will of the deity, decide the soul's fate, but that every soul necessarily finds another habitation after death. Dreams showed that souls might leave their bodies and travel to distant places, and also that souls of the dead still lived. Moreover, if men had souls, so had animals and even trees, for they also possessed life; and the next step was a belief in the transference of souls from one to another. This helped to answer the questions whence came souls at birth and whither do they go after death? As any soul during a man's life may enter at will the body of a beast, so after death the soul of the departed may find shelter either in a man's body or in the frame of a beast. Some savages believe that at the instant when one dies one's soul enters a new body. Others believe that the spirit can remain for some time disembodied, and that it seeks reincarnation, not from necessity, but for pleasure. The Australians believe that souls lurk beside the paths and select their future mothers from the women who pass. In some of the tribes of American Indians resemblances of children to persons recently dead, or even to animals, are used as proofs of the identity of their souls. Sometimes this animistic belief appears sporadically in a much more developed environment and is evidently a reversion. Thus, in the midst of the nature gods of the Teutons we find once in legend and often in folklore a reversion to the belief that men are often liable to be reborn on earth either in human or in animal bodies. Sometimes no rebirth is necessary, but the soul leaps from one body and drives out the soul of the animal whose body it enters. All these beliefs, more or less confused and vague, but persistent through various stages of social development, are found in Europe, India, Asia, and America, while in Africa and in Polynesia, where very little social change has taken place, it may be said to be in its crudest form the usual faith of the people.

While common in primitive, animistic religions, metempsychosis has also been a part of certain advanced religious systems. It was formerly supposed, on the basis of statements of Herodotus, to be found in Egypt, but a more complete knowledge of the Egyptian religion fails to reveal it. The Indian and Greek religions took it up into philosophical systems. Of these the Hindu makes far the most of it. In the earliest Vedic hymns there is no mention of it. In the Upanishads it appears, perhaps borrowed from the aboriginal inhabitants of India. From then on it became a part of the moral structure of Hinduism, as the great means by which Karma (q.v.) operates. It is the way of final salvation. The soul, which is blind and ignorant, will be reborn again and again until at last, after innumerable incarnations, it shall arrive at truth. Then it will know itself to be the absolute, Karma will cease, and rebirth will be ended. It is also used to punish evil and reward good. The soul is doomed to expiate by future rebirths in low forms of life the sins committed in this life. On the other hand, a highly moral life results in one being reborn in a higher caste, as an aristocrat, a king, or a priest, or even as a godling. In this system the length of the series of rebirths depends wholly upon the individual, who works out his own salvation by his own acts. As Buddhism denies the existence of a soul, metempsychosis in India, strictly speaking, is confined to Hinduism. But Buddhism had an analogous belief in the transmigration of character entities, also conditioned by acts, ending in Nirvana, unconscious existence or extinction of personality resulting from extinction of desire and volition. The system was one of transmigration, without any souls to transmigrate. The new personality was the result of the Karma of the old, and all the moral values of the Hindu doctrine were preserved. In Mahayana, or Northern Buddhism, much stress is laid upon the incarnation of the Bodhisattvas, or future Buddhas. The first known appearance of the belief in Greece is in the system of Pythagoras. Herodotus says that he borrowed it from the Egyptians (ii, 123), but there is no present evidence that the Egyptians had such a belief. It has often been surmised that in his travels Pythagoras came in contact with the Indian belief, but there is no need for such a supposition. Indirect influence of Indian thought would not be impossible, but with the widespread ideas of the soul in primitive religion it is not necessary to go far from Greece itself in search of the suggestions on which he built. The belief may be connected with Orphic conceptions of the guilt of the soul. Pythagoras held that the soul was a being cast down to earth because of sin and imprisoned in various bodies till, by means partly magical and partly

ethical, it has worked out its purification, when it returns to its former happy abode. Tradition ascribes to Pythagoras the claim to remember former states. Plato, in the *Republic*, the *Phædrus*, and the *Phædo*, has the same idea of the soul as a fallen spirit, which must work out its own redemption by three times, in three millenniums, making choice of the philosophic life, after which it ascends to its home with the gods. Whether this picture presents Plato's serious belief, or is used as poetic allegory, it is difficult to say. In Neoplatonism, however, it is a part of the philosophical system, and, as in the Hindu system, the soul is a part of the absolute itself. Some of the Gnostics (q.v.) were said to hold to transmigration of souls. The Christian Church almost universally repudiated it, even Origen, who believed in the preëxistence of the soul, rejecting it. It has appeared in the Jewish Cabbala, in the Shiite sect of the Moslems, in the religion of the Druses, and in Babism. In Europe it has occurred sporadically. Leibnitz held a theory akin to the Buddhist Karma, and Lessing consciously adopted metempsychosis. In the present day theosophy is attempting to introduce it into the West, along with other elements of Indian thought. See KARMA.

Bibliography. Rhys Davids, Hibbert Lectures, 1881 (see Appendix V for Origen's opinion) (New York, 1882); Zeller, *Grundriss der Geschichte der griechischen Philosophie* (4th ed., Leipzig, 1893); Hopkins, *Religions of India* (Boston, 1895); Wiedermann, *The Ancient Egyptian Doctrine of the Immortality of the Soul* (London, 1895); F. B. Jevons, *Introduction to the History of Religion* (ib., 1896); Alfred Berthalet, *Transmigration of Souls*, translated by H. C. Chaytor (New York, 1909); G. F. Moore, *Metempsychosis* (Cambridge, Mass., 1914). See HINDUISM.

METENTERON, mĕt-ĕn′tĕr-ŏn. See ALIMENTARY SYSTEM.

ME′TEOR (OF. *meteore*, Fr. *météore*, from Gk. *μετέωρον*, *meteōron*, meteor, from *μετέωρος*, *meteōros*, on high, from *μετά*, *meta*, beyond + *ἀείρειν*, *aeirein*, to lift), FIREBALL, BOLIDE, or SHOOTING STAR. A term applied to those swift-moving points of light which flash out suddenly and dart across the sky along paths which are usually straight and often many miles in length. At one time it was believed that their luminosity was excited by terrestrial magnetism, but it is now generally accepted that they are small solid bodies which enter our atmosphere from outside space and are raised to incandescence by the friction caused by their rapid motion through the air. They frequently rival Venus, and even the moon, in brightness. It is difficult to determine their exact size, but, from the light which they emit, it has been estimated that ordinary shooting stars are extremely small, weighing only a few ounces at most, while Humboldt was of opinion that the diameters of the largest fireballs varied from 500 to 2800 feet. In many cases a long comet-like train of light is left behind. One or two instances are on record where the train of a fireball continued shining for half an hour after the body had disappeared. The cause of this remarkable phenomenon is still obscure, though Professor Trowbridge, of Columbia University, has advanced the interesting theory that it is due to the phosphorescence of the rarefied air along the path of the meteor. The heights at which meteors appear average about 75 miles, and their velocities range from 10 to 40 miles per second. In a narrow sense meteors are those shooting stars which flash into view without detonation or explosion and appear to be completely consumed during their flight through the atmosphere; they are sometimes called bolides. As thus characterized they form a class of bodies distinct from the meteorites (see METEORITE).

One of the most remarkable facts connected with shooting stars is that certain appearances of them are *periodic*. On most occasions they are *sporadic*, i.e., they appear singly, and traverse the sky in all directions. At other times they appear in swarms of thousands, and these swarms are periodic, or recur on the same days of the year. Attention was first directed to this fact on occasion of the prodigious swarm which appeared in North America between Nov. 12 and 13, 1833, described by Professor Olmsted, of New Haven. The stars fell on this occasion like flakes of snow, to the number, as was estimated, of 240,000, in the space of nine hours, varying in size from a moving point or phosphorescent line to globes of the moon's diameter. The most important observation made was that they all appeared to proceed from the same quarter of the heavens, the vicinity, viz., of the star γ, in the constellation Leo; and although that star had changed greatly its height and direction during the time that the phenomenon lasted, they continued to issue from the same point. It was afterward computed by Encke that this point was the very point towards which the earth was moving in her orbit at the time. Attention being directed to recorded appearances of the same kind, it was observed with surprise that several of the most remarkable had occurred on the same day of November, especially that seen by Humboldt and Bonpland at Cumana in 1799 and by other observers over a great extent of the earth. The November stream was again observed in the United States in 1834, between November 13 and 14, though less intense.

Olmsted showed that the emanation of the shower of meteors from a fixed point, or "radiant," as it is called, could be explained by supposing them to have been derived from a cloud of particles moving round the sun in an elliptic orbit which intersects that of the earth at the point at which the latter finds itself in November. Those which are rendered visible when they strike our atmosphere travel along lines which are practically parallel, and the apparent divergence of their paths is due to the fact that what the eye notes is the projection of the true path on the face of the sky. The variable character of the shower at its annual appearances was later elucidated by Olbers, who substituted for Olmsted's cosmical cloud a closed ring of irregularly distributed particles revolving round the sun in such a way that the densest part of the swarm crosses the earth's orbit once in 33 or 34 years, and he even went so far as to predict that the next notable display would occur in 1867. In 1864 Professor Newton, of Yale, took up the investigation of the recurrence of the November meteors, or Leonids, as they are now called from the position of their radiant, and he concluded that there were five possible periods for the meteor ring—33¼ years, 376 days, 354 days, 188 days, and 177 days. In consequence, he was able to predict the occurrence of another striking display of

meteors on Nov. 13–14, 1866, a prediction which was fulfilled with remarkable punctuality. His work was supplemented by the English astronomer Adams, who showed that, of the periods suggested by Newton, the 33¼-year period was the only one consistent with known facts.

There are many other periodic showers. One of particular interest is the shower of Perseids, which occurs between August 10 and 12 and has its radiant in the constellation Perseus. It is noticed in ancient legends as the "fiery tears" of St. Lawrence, whose festival falls on August 10. The principal meteor showers, with the dates of their occurrence, are given below:

Quadrantids	January 2–3
Lyrids	April 20–22
ηAquariids	May 1–6
δAquariids	July 28
Perseids	August 10–12
Orionids	October 18–20
Leonids	November 14–16
Andromedids	November 17–23
Geminids	December 10–12

It is now generally accepted that the periodic meteors are the débris of comets which have been captured by the members of the solar system. It is supposed that the matter composing the tail has been driven off into space, while that of the nucleus has been scattered along the orbit by the disintegrating forces to which it has been subjected. In some cases this disintegration is apparently complete, while in others it is still going on. This view was first definitely propounded by Schiaparelli in 1866, though the division of Biela's comet (q.v.) into two parts had led Kirkwood to practically the same conclusion in 1861. Schiaparelli drew attention to the fact that the Perseids move in the same orbit as Tuttle's comet of 1862, while early in 1867 Leverrier identified the orbit of the Leonids with that of Tempel's comet of 1866 and even assigned 126 A.D. as the year in which this comet was brought into its present orbit by the attraction of Uranus, and Weiss proved that the Andromedid meteors of November 28 were all that remained of Biela's lost comet, which was last seen in 1852. In all about 80 meteor streams have been assigned more or less certainly to known cometary orbits.

METEOR'IC DUST. See DUST.

METEORIC HYPOTHESIS. See COSMOGONY.

METEORIC STONE. See METEORITE.

ME'TEORITE, AËROLITE, METEORIC STONE, URANOLITE, or SIDERITE. A solid body reaching the earth from unknown points beyond the earth's atmosphere. When seen at night meteorites usually consist of a luminous head or fireball, followed by a bright train of incandescent matter. Sometimes there are visible explosions, and even loud detonations are occasionally heard. In the daytime the light of both fireball and train is largely lost against the sky background; it is said, however, that visible clouds at all times replace the luminous train.

There are numerous records and stories in all ages and countries of the fall of stones from the sky, but until comparatively recent times they were treated by scientific men as instances of popular credulity and superstition. It was not till the beginning of the nineteenth century that the fact was established beyond a doubt. According to Livy, a shower of stones fell on the Alban mount, not far from Rome, about 654 B.C. The fall of a great stone at Ægospotami, about 467 B.C., is recorded in the *Parian Chronicle* (see ARUNDEL MARBLES) and by Plutarch and Pliny. It was still shown in the days of Pliny (died 79 A.D.), who describes it as the size of a wagon and of a burned color. In the year 1492 A.D. a ponderous stone weighing 260 pounds fell from the sky near the village of Ensisheim in Alsace; part of it is still to be seen in the village church. An extraordinary shower of stones fell near Laigle in Normandy, on April 26, 1803. The celebrated French physicist, M. Biot, was deputed by the government to repair to the spot and collect the authentic facts, and since the date of his report the reality of such occurrences has no longer been questioned. Nearly all the inhabitants of a large district had seen the cloud, heard the noises, and observed the stones fall. Within an elliptical area of 7 miles by 3 the number of stones that had fallen could not be less than two or three thousand; the largest were 17 pounds in weight. These are only a few out of hundreds of instances on record.

As is natural with objects of such mysterious origin, meteoric stones have always been regarded with religious veneration. At Emesa in Syria the sun was worshiped under the form of a black stone, reported to have fallen from heaven. The holy Kaaba of Mecca and the great stone of the pyramid of Cholula in Mexico both have a similar history. The existence of such bodies once admitted led to assigning a meteoric character to strange ferruginous masses found in different countries, which had no history or were only adverted to in vague tradition. Of this kind is the immense mass seen by Pallas in Siberia, now in the Imperial Museum in St. Petersburg. The largest aërolite known is probably the immense mass called Ahnighito (the Tent), which was discovered by Lieutenant Peary, in 1894, near Melville Bay, 30 miles east of Cape York in northern Greenland. With it were two smaller ones, known respectively as "the Woman" and "the Dog." The three masses had long been used by the Eskimo as a source of iron for the manufacture of knives and other weapons, and were supposed to have been hurled from the heavens by the evil spirits. The dimensions of Ahnighito are as follows: length, 11½ feet; width, 7½ feet; thickness, 3½ feet. Its weight is 37½ tons. It was brought to New York with its two companions in 1897, and since 1904 has rested under the entrance arch of the Museum of Natural History. Its nearest rival is Bacubirito, a huge mass discovered half buried in the ground near the old mining town of Bacubirito in the State of Sinaloa, Mexico. Its weight is said to be 51 tons, but as the mass has never been raised from the place where it originally fell, no correct measurements of its dimensions have been possible, and its weight has doubtless been overestimated.

One constant characteristic of meteoric stones is the fused black crust, like varnish, with which the surface is coated. This coat is very thin and is separated from the inner mass by a sharply defined line. It is due to the action of heat generated by the rapid motion of the meteor through the atmosphere. The specific gravity of meteoric stones ranges from two to seven or eight times that of water. Chemically they have the same composition as our earth, the chief constituent being nickel iron, which

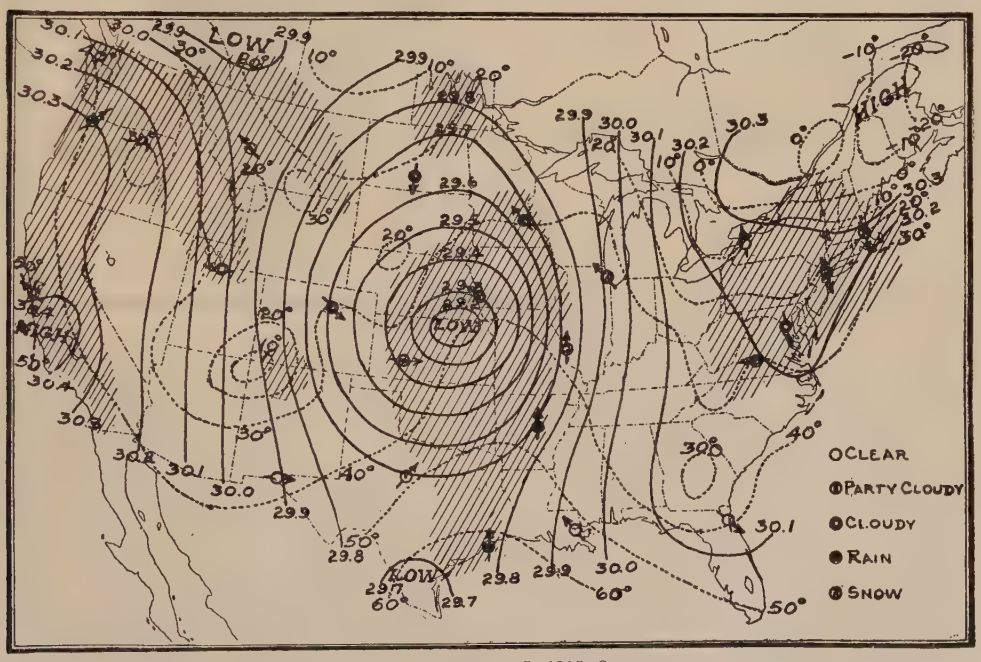
occurs in variable proportions. No new element has been found in them, and only about 30 of those already known. But these old elements are often combined in the form of minerals not yet known on the earth.

Besides these solid masses of considerable size numerous instances are on record of showers of meteoric dust over large tracts of land. See DUST.

It remains to notice briefly the various opinions that have been advanced as to the origin of meteorites. It might be supposed that they are simply meteors which are so large that they are not completely consumed in their rapid passage through the atmosphere, but they differ from meteors in one important respect. They are invariably sporadic; no meteorite is known with certainty to have been a member of any meteoric shower, though there are at least two instances on record where a meteorite fell during such a shower. The hypotheses that have been formed in answer to the question, Whence come those solid masses that fall upon the earth? are of two kinds, some ascribing to them a telluric origin and others making them alien to the earth. Of the first kind is the conjecture that they may be stones ejected from terrestrial volcanoes, revolving for a time along with the earth and at last returning to it. It is difficult, however, to imagine that the velocity requisite to carry them beyond the limits of the earth's atmosphere and prevent their immediate return could have been imparted by any terrestrial eruption, for there is no reason to suppose that the eruptions of the past have differed in violence to any great degree from those of the present day. In seeking a source beyond the earth the moon readily presents itself. Olbers was the first to investigate (1795) the initial velocity necessary to bring to the earth masses projected from the moon. He showed that to account for the actual measured velocity of meteoric stones the original velocity of projection must be no less than 40 or 50 times that of a cannon ball, which makes the hypothesis improbable. Another and perhaps more plausible hypothesis is that which considers them to be minute members of the solar system, similar to the planetoids, which are captured from time to time by the earth. Consult: S. Mennier, "Les météorites," in *Encyclopédie chimique*, vol. ii (Paris, 1884); E. W. Cohen, *Meteoritenkunde* (Stuttgart, 1894–1905); Lazarus Fletcher, *Introduction to the Study of Meteorites* (London, 1904).

ME'TEOROLOG'ICAL SOCIETY, THE ROYAL. A learned association, established in 1850, incorporated in 1866, and allowed to adopt the prefix "Royal" in 1883. The society has its headquarters in London. The objects are the promotion of meteorology in all its branches and the recording of data and theories relating to the subject. Its membership consists of fellows and honorary members, the latter being foreigners of distinction. The publication of the society is the *Quarterly Journal*. During the session 1913–14, 18 papers were read and were afterward printed in the *Quarterly Journal*. The society meets on the third Wednesday in each month from November to April, and the annual meeting takes place in January. The president in 1914 was C. J. P. Carl, and the secretaries Francis Campbell Bayard and W. F. Caborne.

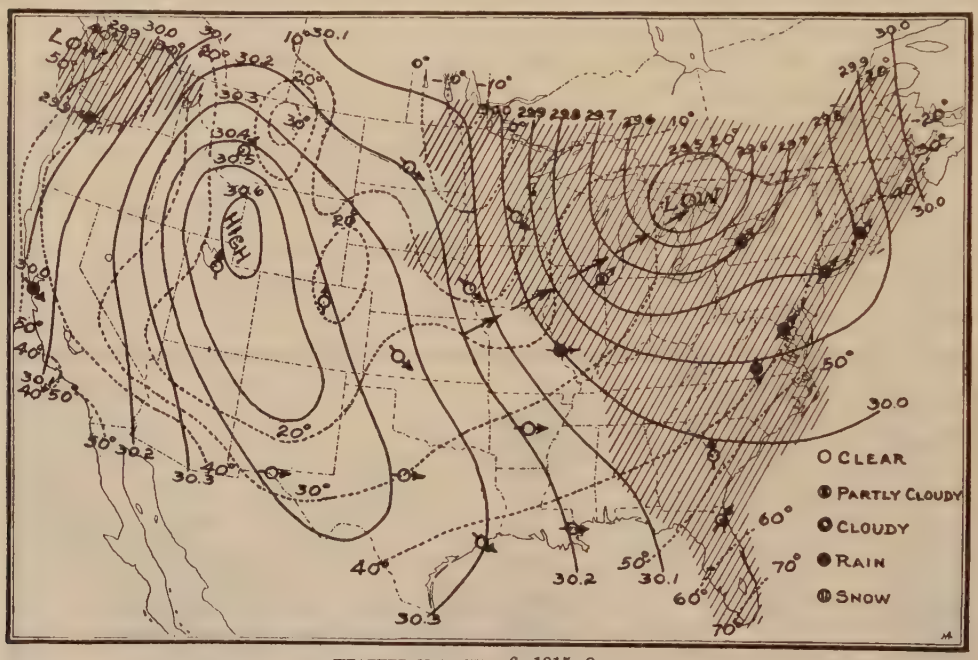
ME'TEOROL'OGY (Gk. μετεωρολογία, *meteōrologia*, treatise on celestial phenomena, from μετεωρολόγος, *meteōrologos*, discussing celestial phenomena, from μετέωρον, *meteōron*, meteor + λέγειν, *legein*, to say). The study of the atmosphere and its phenomena. Efforts are being made by every civilized nation to apply to the benefit of mankind the knowledge we possess of meteorology, especially to foretell the winds and weather from day to day and the general



WEATHER MAP, FEB. 5, 1915, 8 A.M.

character of the seasons from season to season. About 50 official governmental weather bureaus receive reports from their stations by telegraph daily, compile weather maps, issue forecasts, and publish weekly, monthly, or annual climatological summaries, together with frequent special meteorological memoirs. Among the most prominent of these, on account of the extent of their territory and the value of their publications, are those of Austria-Hungary, Great Britain, France, Germany, Italy, Russia, India, Argentine Republic, Canada, and the United States. The total annual expenditure by all government services on meteorological work is not less than $3,000,000, to which should be added an equal sum to represent the great amount of work that is done without pay by voluntary observers. Several private meteorological establishments have been founded by wealthy lovers of science, most prominent among which are those of Vallot, on Mont Blanc; A. Lawrence Rotch at Blue Hill, near Boston (since his death (1912) the property of Harvard University); L. Teisserenc de Bort at Trappes, near Paris. There are also numerous municipal observatories, prominent among which are that of the New York City Central Park, Dr. Daniel Draper, director, and those of Montsouris and the Tour St. Jacques in Paris, of which Dr. J. Joubert is director. Observatories are also maintained by special associations, such as those on the Santis, Austria, the Jesuit observatories of St. Hélier, Havana, Zikawei, and Manila. Special mention should be made of Symons's British Rainfall System, to the development of which his life was devoted and the perpetuity of which is now assured by the terms of his will. Over 300 stations are maintained in the British Isles. Organized systems of rainfall stations have also been maintained in Mauritius, Jamaica, Barbados, Antigua, and St. Kitts.

In addition to its material progress in observers and apparatus, theoretical meteorology has especially profited by the labors of eminent physicists. Those who have, since 1850, contributed most to our knowledge of the mechanics and physics of the atmosphere may be enumerated as follows: Adolph Erman, who published in 1868 a memoir on the distribution of winds and pressure over the globe; J. C. Redfield, who showed the mechanism of extended hurricanes; James P. Espy, who published several reports and a volume on the philosophy of storms, explaining in general how atmospheric moisture, by its condensation into cloud and rain, disturbs the equilibrium of the atmosphere and produces both local and general storms; William Ferrel, who published numerous papers developing the laws of the motions of the earth's atmosphere and its general and local phenomena as resulting from the rotation of the earth on its axis, the evaporation and condensation of aqueous vapor, and the general influence of the solar heat; Lord Kelvin, who first gave the laws of thermal convective equilibrium for dry air; Peslin, who gave the laws of thermal equilibrium for moist air; Von Helmholtz, Willy Wien, Oberbeck, Guldberg and Mohn, Margules, Diro Kitao, Rayleigh, Pockels, Sprung, V. Bjerknes, and J. W. Sandström have made important contributions to the hydrodynamic problems of the atmosphere; Prof. H. Hertz, W. von Bezold, and Marcel Brillouin have contributed greatly to the perfection of our knowledge of the thermodynamic problems. Noteworthy contributions in this field include that of Pockels, on the theory of the formation of rain in slowly ascending currents of moist air (see *Wiedemann's Annalen*, January, 1901); Prof. F. H. Bigelow's tables in his reports on international cloud work (Washington, 1900); his report on barometry (Washington, 1902); Neuhoff's memoir on adiabatic changes in the atmosphere (Ber-



WEATHER MAP, FEB. 6, 1915, 8 A.M.

lin, 1900); Berson and Assmann's *Scientific Balloon Ascensions* (3 vols., 4to, Berlin, 1900); Bjerknes and Sandström, *Dynamic Meteorology and Hydrology* (2 vols., 4to, so far, Washington, D. C., 1910, 1913).

Our knowledge of meteorological conditions has been obtained for the most part by observation of the clouds or by stations on mountain tops. More recently it has been found desirable to study conditions at considerable altitudes above stations and places. In order to obtain better data for the lower atmosphere, at least partially to meet the needs of the case, Americans and Europeans have developed the art of obtaining meteorographic records by sending up meteorographs on kites to heights of 1 or 2 miles; on the other hand, Europeans have given special attention to the development of the balloon and especially the small sounding balloon which can carry a meteorograph to an elevation of 7 or 15 miles above sea level, where man cannot live. The exposure of meteorological apparatus so that the records from different stations on the earth's surface and from vessels on the ocean and from kites or balloons in the atmosphere shall be comparable with each other offers many difficult problems, but the progress towards uniformity throughout the world has been appreciable during the past 40 years. Every first-class weather service now keeps close watch of the condition of its apparatus and the correctness of the methods in vogue at its stations. Although much remains to be done, yet the contrast between the condition of affairs in 1850 and that in 1915 is very great.

In some cases the larger portion of the funds and forces of a weather service is spent upon observations and climatological work, but in most cases the daily forecast work takes precedence, since that promises immediate results in saving life and property. In order to carry on this work properly numerous stations must be connected by telegraph with the central bureau, at which several simultaneous observations must be received daily from the observers, and weather charts must be promptly made out showing the isobars, isotherms, state of the wind and weather, moisture, and clouds over a large region of country. The accompanying charts, for February 5, 8 A.M., and February 6, 8 A.M., 1915, show the general character of such daily weather maps; they will easily be understood by studying the respective legends. On these charts the reader will see the development of a storm that began with an area of low pressure in Kansas and rapidly developed into the great storm centre shown on the second chart; the storm then passed northeastward over the Lake Region and the Gulf of St. Lawrence and was followed by an extensive area of clear cool weather on February 7. The movements and changes of storms and weather will undoubtedly be fully understood only in proportion as we have better knowledge of the facts and of the mechanical and physical laws that govern the atmosphere, but their approximate prediction from day to day is expected and demanded by reason of the many interests that depend upon the wind, temperature, and weather. At present such forecasts are generally based on the evident trend of events, as shown by comparing the two or three latest weather maps, and in part also on empirical rules or generalizations, based on the study of similar types of maps in preceding years; but in some cases also one may be guided in part by general physical principles that must apply to the case in hand. The generalizations relative to storm movements for the United States, i.e., the statistics of storms, have been presented in three memoirs by Prof. Elias Loomis and printed in the *Memoirs of the National Academy of Sciences*. These were supplemented in 1914 by E. A. Bowie in *Monthly Weather Review, Supplement No. 1*. Similar data for the Northern Hemisphere as a whole were published in 1893 in *Bulletin A* of the United States Weather Bureau; this compilation is mostly the work of Prof. E. B. Garriott and is based upon 10 years of daily maps (1878 to 1887), originally published in the *Bulletin of International Simultaneous Observations*. In this volume the paths of the storm centres are classified by different types and displayed on charts that show the frequency with which storm centres pass over each square of latitude and longitude.

Charts of storm paths for Europe, Asia, and Japan have been published by Germany, Russia, and Japan respectively, and monthly charts for the United States have been published regularly since January, 1873. By means of these charts one may, in a general way, anticipate the path and velocity of a storm centre when once it has appeared in any part of the Northern Hemisphere. In the Northern Hemisphere such centres move westward when they lie between the equator and the parallels of 25° or 30° N.; they then curve poleward and move northeastward with increasing rapidity towards the parallel of 60° or 70°. The variations from this general rule can best be understood by studying the charts of storm frequency. A similar rule holds good for the Southern Hemisphere, substituting only south for north. But little is known about the tracks of storms within the Arctic circle. The known region of greatest storm frequency extends in a narrow belt east and west from Lake Superior to Newfoundland and its prolongation eastward ends in the interior of northern Russia. The region of next greatest storm frequency covers the islands of Japan. The north polar region of cold air, whose tendency is to flow outward towards the equator, is inclosed within an oval curve extending from Luzon over Japan, southern Alaska, British Columbia, the region of the Great Lakes, Newfoundland, the Hebrides, northern Norway and Sweden, and ending in Siberia at lat. 60° and long. 90° east of Greenwich. South of this oval the prevailing winds are west and southwest; north of it they are north and east in the stormy season of the year.

The great whirls that we call general storms occur in connection with these polar and equatorial currents, but not necessarily between them. The whirls are explained as partially due to mechanical reactions between the northern and southern currents, but they are not merely hydrodynamic phenomena, since they have also an additional thermodynamic relationship which is quite as important. The warm, moist southerly winds are underrun by the colder and drier northerly winds. This enforced elevation of the southerly winds is accompanied by a corresponding expansion and cooling of the air that is thus elevated, and generally it is soon cooled to its dew point or below. This is followed by condensation of aqueous vapor and the formation of cloud, rain, hail, or snow with a great liberation of latent heat. Consequently

the cloudy region will be warmer, but especially will it have a much smaller specific gravity than before.

In very small storms, such as tornadoes, waterspouts, etc., this process gives rise to very rapid uprising currents, a very rapid whirl around the central axis, and a very low barometric pressure at the centre, but in extensive storms the vertical current is not so conspicuous, although the buoyancy of the central air tends very strongly to maintain the disturbance. The storm centre undoubtedly has a tendency to move towards the region in which the temperature and buoyancy are most disturbed; but as this region is always moving in advance, the storm centre will remain in the rear and its path will advance somewhat to the left of the direction of the greatest disturbance. But the uplifting of the lower moist air may be greatly intensified if the southerly winds on the eastern half of the storm area are being pushed up over high lands, or it may be almost wholly annulled if these winds must necessarily descend from the high lands to the ocean level. Therefore the relation of the storm's motion to the continents must be carefully worked out.

As regards weather prediction, it is evident at once that the descending winds and those that are coming from the north southward are being warmed up, and therefore in their presence the storm disappears and the weather clears away. For the Atlantic coast of North America rain is to be forecast only when a south and east wind prevails, and especially when it is blowing on the coast. The actual effect of mountains, plateaus, continents, and the underflow of cold air varies so much on every occasion that the best one can do in forecasting is to familiarize himself thoroughly with the illustrations and exceptions that appear on every daily weather map.

The atmosphere would be at rest on the earth's surface and whirl about with the globe were it not for the sun's heat. All the important meteorological phenomena may be considered as resulting from the interaction of the solar heat, the moisture in the air, the varying temperature, and the centrifugal reaction due to the rapid diurnal rotation of the earth on its axis. The solar radiation maintains the temperature of the equatorial regions. The cold air of the polar region is both by gravity and by centrifugal force driven towards the equator. Thus the general currents are maintained moving from the poles towards the tropics and return. They are most intense in the Northern Hemisphere in January, when the sun is farthest south or over the tropic of Capricorn, because at that time and subsequently the difference of temperature between the equator and the North Pole is greatest, and the reverse holds good in June, when the sun is north of the equator. The general circulation is greatly modified by the difference in temperature and moisture of the air over the land and the ocean, so that in summer time the tendency of the air to flow inward towards a continent or mountain is very decided. The general circulation is also greatly modified by the presence of snow, ice, mountains, plateaus, clouds, forest, etc. The winds, when once formed by differences of temperature and moisture, are themselves affected by the rotation of the earth. No matter in what direction they may be moving they are at once deflected from their polar path; in the Northern Hemisphere they turn to the right; in the Southern Hemisphere to the left. Therefore those flowing towards the equator become the northeast and southeast trade winds and those flowing towards the poles, or the upper return trade winds, become the westerly winds of the north and south temperate zones.

The differences in temperature between the continents and the ocean give rise to the so-called monsoon winds. The general centrifugal action of the winds produces a low pressure in the regions about which the winds rotate, viz., a low pressure in the Arctic and Antarctic regions; a low pressure on the left of the winds blowing around a storm centre and on the right-hand side of these same winds considered as blowing around an adjacent region of high pressure; a low pressure at the equator between the northeast and southeast trades. The reaction of the easterly winds near the equator and the westerly winds farther north also produces a similar area of high pressure between these two systems of wind corresponding to the high pressure under the tropics of Cancer and Capricorn.

A full exposition on these and other theorems by Prof. William Ferrel will be found in his *Treatise on the Winds* (New York, 1893). The results of later researches are presented in Prof. F. H. Bigelow's report on international cloud observations (Washington, 1900) and his report on barometry (Washington, 1902), but these are written for purely technical and mathematical readers. A general résumé of the laws of atmospheric motion is given in the appendix to Hann, *Lehrbuch der Meteorologie* (3d ed., Leipzig, 1914). An elementary presentation of the subject will be found in Davis, *Elementary Meteorology* (Boston, 1894); in Ward, *Practical Exercises in Elementary Meteorology* (Boston, 1899); Moore, *Descriptive Meteorology* (New York, 1910); and in Milham, *Meteorology* (New York, 1912). Consult Flammarion, *Thunder and Lightning* (Boston, 1906). For history of practical meteorology in the United States, see WEATHER BUREAU.

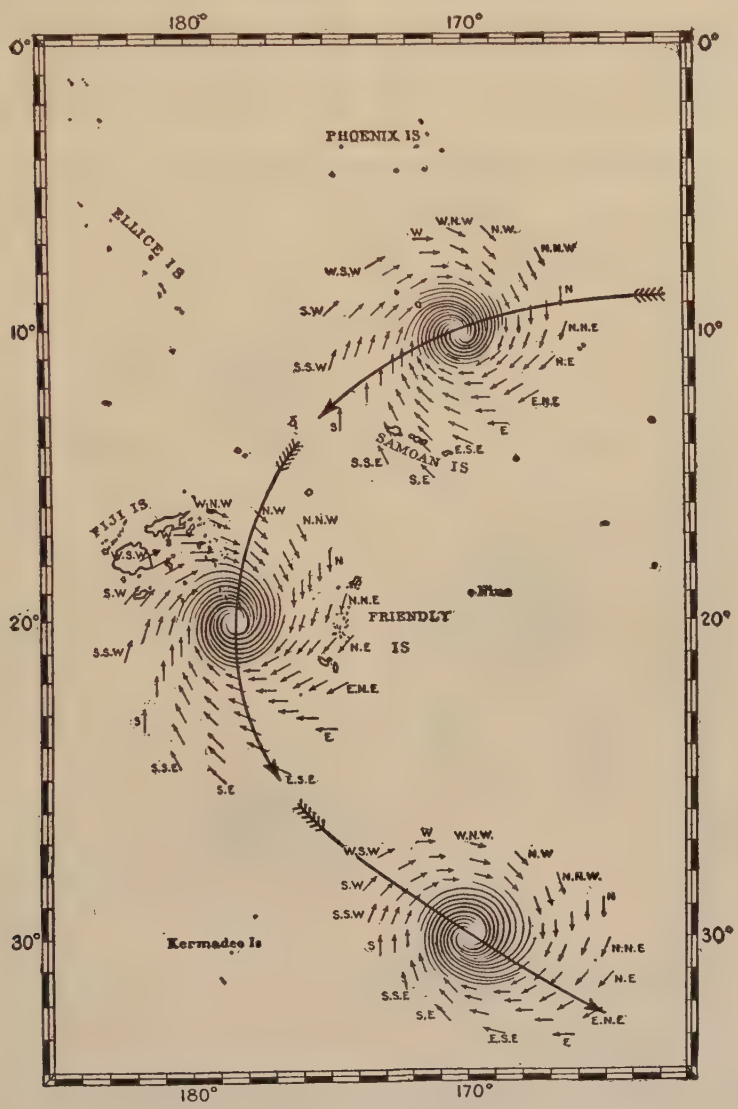
Some details as to the instruments used in meteorology will be found under the topics: ACTINOMETER; ANEMOMETER; BAROMETER; PYRHELIOMETER; NEPHOSCOPE; RAIN GAUGE; THERMOMETER. Some of the results of observation will be found treated under the topics: ATMOSPHERE; ATMOSPHERIC ELECTRICITY; AURORA BOREALIS; BLIZZARD; CLIMATE; CLOUD; DARK DAY; DEW; DOLDRUMS; DUST; EQUINOCTIAL STORM; FOG; FROST; HAIL; HALO; HUMIDITY; INDIAN SUMMER; ISOBAROMETRIC LINES; ISOTHERMAL LINES; LIGHTNING; MONSOON; POLARIZATION OF SKYLIGHT; SCINTILLATION; SIMOOM; SNOW; SNOW LINE; STORM; HEAT; TERRESTRIAL ELECTRICITY; TYPHOON; WEATHER; WHIRLWIND; WIND.

METEOROLOGY, MARINE. Information as to the kind of weather which may be expected at sea at different times and in different localities and a knowledge of the best means of avoiding or minimizing the effect of unfavorable conditions are of the utmost importance to the maritime world in order that ships may be able to navigate more safely and economically and with the greatest possible ease and comfort. The subject has attracted more or less attention for thousands of years, for storms on the water are greatly to be feared by all who traverse the sea in any except the very large vessels of recent times and are to be avoided if practicable

even by these. The first systematic and practical attempts to collect, consider, and publish definite, correct, and useful meteorological and oceanographic information were made by Lieutenant (afterward Commander) Matthew F. Maury (q.v.) of the United States navy; and the United States Naval Hydrographic Office, which Maury founded, to-day supplies to the mariner more information of this character than he can obtain from any other source, possibly from all other sources combined. The general subject of meteorology is so fully treated in the foregoing pages and elsewhere under its various branches (see references at the end of this article and the preceding) that only the general nautical features will be considered under this head.

Practical marine meteorology may be divided into a study of (*a*) air conditions, (*b*) air movements, (*c*) instruments used aboard ships for ascertaining air conditions and the methods of taking and recording observations and developing the results for use.

Air conditions include temperature, pressure, hygrometric state, and their results, such as freezing, rain, snow, hail, fog, mist, air movements, and calms. The tendency of air conditions at sea is the same as on land, but the results are somewhat different, owing to comparatively stable (i.e., slowly changing and through moderate ranges of temperature) water temperatures and the unobstructed sweep of air movements, while on land the temperature of the surface may change rapidly and the irregular character of its elevations greatly modifies the force and direction of air currents. Aside from air movements the most important results of air conditions are fog and thick weather of all kinds in which seeing is difficult. Thick fog is very serious and is always to be avoided if practicable. Freezing weather, in which the rigging becomes clogged with ice and



AVERAGE STORM TRACK IN SOUTHERN HEMISPHERE (SOUTH PACIFIC).

the sails cannot be handled, is becoming less important as the number of sailing ships is reduced. Calms, which bereft the sailing ship of its motive power, are a blessing to steamers by insuring smooth water.

Air movements include: (1) trade winds (q.v.) and other winds (see WIND) of a permanent or semipermanent character; (2) periodical winds such as monsoons (see MONSOON), land and sea breezes, etc.; (3) variable winds of moderate force; and (4) storms (see STORM). As regards sailing ships the first three kinds of winds may be regarded as beneficent, as they furnish the means for locomotion, and as regards steamers they are either unimportant or only moderately objectionable. Storms, however, are to be shunned by all classes of vessels. They vary in character. Some are violent winds that are nearly constant in direction when blowing at maximum force. Such are the northers of the gulfs of Mexico and Tehuantepec, the pamperos of Uruguay and Argentina, and the mistral, bora, and levanter of the Mediterranean. The most important storms from a nautical standpoint are the cyclones, because they are of frequent occurrence, of large area, the winds are stronger than in most other sea storms, and their movements are responsible for the development of many of the local linear gales and heavy winds. See STORM.

A large percentage of the well-defined cyclonic storms of wide and great severity have their birth in the tropics. The cyclonic storms which have their origins in the temperate zones mostly start from points in the eastern parts of the various oceans and move easterly across a continent before they reach the ocean again, so that usually their force is by that time greatly reduced. In many cases their tracks are curved so far to the northward at the eastern end as to be beyond the vicinity of much shipping. With the tropical cyclones the case is different. Their tracks are along populous coasts and over seas filled with ships and frequently extend beyond the fiftieth parallel of latitude. Their occurrence is confined almost wholly to the summer and autumn months and to the western side of the several oceans—the North Atlantic, North Pacific, South Pacific, and Indian oceans; they are unknown in the South Atlantic. The Arabian Sea and the Bay of Bengal are also visited by cyclonic storms which occur most frequently in May and October. A tabulation of West India hurricanes for the decade 1890–1900 showed that they occurred as follows: in June, 1; July, 2; August, 8; September, 19; October, 22; November, 4.

The four great centres of cyclonic activity are: the West Indies and the east coast of the United States; the Philippine Islands and China Sea; Samoa, Fiji, and Tonga Islands; Mauritius. On account of the volume of its seaborne trade the

AVERAGE STORM TRACK IN NORTHERN HEMISPHERE (WEST INDIES AND UNITED STATES).

first-named region is the most important, but the area which includes the Philippines, China Sea, and coasts of China and Japan is certainly a close second. From the number of vessels which traverse these seas our knowledge of the behavior of the storms in them is fairly complete.

It is noted that all tropical cyclones are born in regions of comparative calm about 10 degrees of latitude from the equator. The centre moves first to the westward and then its path curves gradually away from the equator and finally reaches northeast in the Northern Hemisphere and southeast in the Southern. The tracks are not always the same. The average path is different for each month and there are occasional marked exceptions to the general rules, owing usually to local meteorological conditions which modify those of the storm. The speed of movement of the centre of the cyclone along its track is variable. In the tropics it is from 5 to 20 miles per hour, always decreasing as the storm track turns away from the equator and recurves and then increasing until a rate of 50 miles an hour is sometimes reached in temperate regions. Within the tropics the storm area is comparatively small, the violent winds seldom being found more than 150 miles from the centre. The barometric pressure falls rapidly, however, as the centre is approached, a difference of two inches having been observed within the distance mentioned. The winds therefore blow with greater violence, and their directions are more symmetrical with respect to the centre than is the case in higher latitudes. After recurving, the area usually increases and the winds become less severe. The centre is no longer a small, well-defined area over which the sky is nearly clear and near which the winds blow with the greatest violence, but broadens until it is not easily recognizable, and the strongest winds are often found at some distance from it.

The approach of a tropical cyclone is almost invariably preceded by a nearly cloudless sky and marked clearness of the atmosphere—islands, mountains, and distant vessels are seen with great distinctness, while the temperature is abnormally high and made more oppressive by a cessation or reduction of the ordinary breezes. All this is commonly accompanied by an unusually high barometer which becomes unsteady as the air disturbance approaches. The sky then begins to be covered by a light cirrus haze which becomes more and more dense until the true hurricane cloud appears on the horizon in the approximate direction from which the centre is approaching. Portions of this begin to be detached and drift across the sky, accompanied by rain squalls and wind of increasing force. The rain along the edges of the storm area is mist-like, with occasional showers which increase in frequency and heaviness towards the centre, where the rain falls in torrents. One of the indications of an approaching cyclone is a heavy swell coming from the direction of the centre, and this frequently sets in before any other indication becomes marked.

By the time the hurricane cloud appears on the horizon the barometer will be unmistakably falling. If the centre passes far away, the fall will not be great, but the weather will be unsettled and showers frequent; ordinary trades will be increased in force and squally north of the centre (in the Northern Hemisphere), while variable winds will be found south of the centre, usually from a southeasterly direction.

If the observer is within the real storm area the barometer continues to fall and, unless he is in the path of the centre, the wind will begin to shift, the changes usually being accompanied by heavy squalls. These changes afford a means of determining the direction of the centre and the path of the storm, so that it may be avoided. The wind does not blow exactly towards the centre, but around it in a manner to develop a sort of spiral in which the direction of the wind is opposite to that of the movement of the hands of a watch in the Northern Hemisphere and in the same direction as the hands of a watch in the Southern. This spiral effect and the storm tracks are shown in the accompanying plates. If an observer within the storm area faces the wind, the centre bears about 10 points (112.5°) to the right, if in the Northern Hemisphere, and 10 points to the left, if in the Southern. By noting the direction of the wind at frequent intervals the direction of the centre can be obtained a sufficient number of times to determine its approximate path and probable distance. If the barometer falls without a change in the direction of the wind, the observer is in the path of the centre.

Having determined the path of the centre, it can be avoided unless the sea is too rough to lay a proper course for the purpose, in which case vessels must heave to and let the storm pass by. Rules for the handling of vessels in cyclones are given in the article on navigation.

The instruments used on board ship for making weather observations are the thermometer, barometer, hygrometer, compass, rain gauge, wind gauge, or anemometer, and the barocyclonometer. With the exception of the last named these are of ordinary type and are adequately described under their own heads. The barocyclonometer is an instrument invented by Father José Algue, S. J., director of the Philippine Weather Observatory. It consists of a special form of aneroid barometer that is not absolutely essential to the operation of the instrument and a disk which is a graphic representation of the cyclonic wind swirl about the storm centre. Two pointers, which may be set at any angle, are pivoted at the centre of the disk, and one of these carries a secondary pointer pivoted about two-thirds the length from its own axis. By setting these in accordance with certain tabular data, with the corrected barometer readings and with the observed directions of the wind, the approximate distance and direction of the storm centre may be obtained as well as the speed along its path. The tables and storm disk were originally prepared for the typhoons of the East, but the instrument is now being adapted for use in the West Indies and along the United States coast. See METEOROLOGY; WEATHER; WIND; STORM; NAVIGATION; HYDROGRAPHIC OFFICE; CHART; PILOT CHART; also bibliography under METEOROLOGY, STORM, ETC.

ME'TER. See METRIC SYSTEM.

METER, ELECTRIC. See ELECTRIC METERS.

METER, GAS. See GAS, ILLUMINATING.

METH'ANE (from *methyl*), MARSH GAS, FIRE DAMP (Ger. *Sumpfgas*), CH_4. The simplest of the compounds of carbon and hydrogen, usually prepared by strongly heating a mixture of sodium acetate and soda lime. It is one of the gaseous products of the decay of vegetable matter (especially cellulose) under water and is therefore a constituent of the gases bubbling up in the stagnant water of marshes; it is also one

of the gases evolved in petroleum wells, and natural gas contains about 90 per cent of methane. Considerable quantities of methane occur also in coal mines, where the gas, mixed with air, has often caused disastrous explosions. Methane is a colorless and odorless gas burning with a non-luminous flame. It is formed in the destructive distillation of organic matter, such as wood, coal, etc., and is, therefore, one of the principal constituents of ordinary illuminating gas, which contains 30–40 per cent of methane. A very large number of organic compounds can be derived from methane; and since the gradual building up of these compounds from the elements is a matter of great importance in organic chemistry, the synthesis of methane itself, as the first step in innumerable processes employed in producing organic compounds, formed a valuable contribution to chemical science. The synthesis of methane was first effected by Berthelot, who showed that the gas is produced when a mixture of carbon disulphide and water vapor is passed over red-hot copper. The reaction taking place is represented by the following chemical equation:

$$\underset{\text{Carbon disulphide}}{CS_2} + \underset{\text{Water}}{2H_2O} + \underset{\text{Copper}}{6Cu} = \underset{\text{Methane}}{CH_4} + \underset{\text{Cuprous sulphide}}{2Cu_2S} + \underset{\text{Cupric oxide}}{2CuO}.$$

In this manner methane can be obtained by using nothing but elementary substances as starting material, for carbon disulphide and water can be prepared by the direct union of their elements. Another synthesis of methane results when the silent electric discharge is caused to act upon a mixture of carbon monoxide and hydrogen. Still another synthetic method consists in the action of water upon the carbide of aluminium. But the most direct synthesis of methane was carried out by Bone and Jerdan, who succeeded in obtaining methane by heating its elements, carbon and hydrogen, to 1200° C. (2192°F.). Very pure methane may be prepared by decomposing zinc methyl with water or by the GRIGNARD REACTION (q.v.).

METHANE SERIES. See HYDROCARBONS.

METH'ODISM. The name given to the religious movement in England led by John Wesley, appropriated by the numerous churches which have sprung from that movement and by others which, though not bearing the name, are both historically and spiritually in the Methodist succession. Wesley himself was impatient of sectarian names and called the people whom he enrolled in classes for religious culture simply the United Societies and proudly appealed to the fact that to join the Societies there was needed no dogmatic or ecclesiastical test, all Christians from Anglicans to Quakers being alike welcome. His definition of a Methodist (abridged) was as follows: "A Methodist is one who has the love of God shed abroad in his heart by the Holy Ghost given unto him; one who loves the Lord his God with all his heart, and soul, and mind, and strength. He rejoices evermore, prays without ceasing, and in everything gives thanks. His heart is full of love to all mankind, and is purified from envy, malice, wrath, and every unkind affection. His one desire, and the one design of his life, is not to do his own will, but the will of Him that sent him. He keeps all God's commandments, from the least to the greatest. He follows not the customs of the world; for vice does not lose its nature through its becoming fashionable. He fares not sumptuously every day. He cannot lay up treasure upon the earth; nor can he adorn himself with gold or costly apparel. He cannot join in any diversion that has the least tendency to vice. He cannot speak evil of his neighbor any more than he can tell a lie. He cannot utter unkind or evil words. No corrupt communication ever comes out of his mouth. He does good unto all men; unto neighbors, strangers, friends, and enemies. These are the principles and practices of our sect. These are the marks of a true Methodist. By these alone do Methodists desire to be distinguished from other men." Wesley's catholicity was so broad that he was not greatly concerned whether the books he reprinted for his people were by Roman Catholics or Unitarians so long as they were to religious edification. It was his hope that his movement would be the nucleus of a reunited Christendom, and it was with sorrow he saw forces which he could not control carrying his people into permanent separation. The title Methodist was not a word of his own choosing—it was given by Oxford students because of the strict life of Charles Wesley and his band in the university—but he took it up as a matter of course and it became an ecclesiastical watchword.

It must be remembered that the churches which go under the name of Methodism were not the largest part of the results of the movement. It stimulated tremendously every Protestant church, besides sending thousands of converts into those churches. It imparted new life and hope to Christendom. It was one of the forces which led to the abolition of slavery. Wesley initiated several charitable schemes, and his work overflowed into permanent forms of benevolence. The common people of England and America received such a stimulus to intellectual religious life and expression that they began to take an interest in education and political and social reforms. Laymen who were leaders in the meetings (class leaders, exhorters, local preachers) became protagonists in progressive propaganda. Political and social legislation of the nineteenth century rested back on a revived consciousness of the masses which was born of Methodism. Though Wesleyan Methodism itself was excessively conservative in the first half of the nineteenth century, partly because as a reaction to criticism and persecution it wanted to commend itself to the authorities and to the higher classes, and partly through an overtimid deference to the Established church, its members were thoroughly alive to popular rights—so much so that almost every important advance in political liberalism and social amelioration went hand in hand with an exodus of eager reformers out of Wesleyanism to form a new Methodist church or reënforce other churches or devote themselves solely to secular betterment. On the surface the secessions were ecclesiastical; deeper they were also political and economic—the cry of men awakened by the Gospel for the liberty of the sons of God. Before the Methodist movement did its work the sodden condition of the English peasantry was fearful. After its work was done the formation of political, agricultural, social, and literary societies was possible. The mass of the peasants could not have been moved at all, says Prof. J. Thorold Rogers, nor would the formation of agricultural unions have been possible, had it not been for the previous work of the Methodist preachers. (*Six Centuries of Work and Wages*, 6th ed., p. 516.) Wesley struck the first note of the temperance reform, and with terrific power. The religious

and moral interests of the movement were so engrossing that the people of England were saved from the extreme doctrines of the French Revolution and from a violent application of its healthful doctrines. Modern mission work at home and abroad, the institutional church, the cheap press, universal appeal by tract and pamphlet to the reason of the common man, were congenial to Wesley's large-minded insight into the needs of men and, with other modern methods, were anticipated by him.

Polity. The polity of early Methodism was suggested by exigencies in the growth of the revival of which it was the outcome. Methodism as an organization dates from 1739, the loosest possible in form. A few Christians met together weekly in classes (the class meeting) to pray and to talk concerning the things of God, over whom a leader (a layman) was appointed, whose duty it was to watch over their souls and to give spiritual counsel. The societies were independent of each other, except as they were held together by the itinerating Wesley, who appointed their leaders and to whom these leaders were responsible. In 1743 Wesley drew up the rules for the United Societies, which have remained the ethical standard of teaching and practice from that day to this. As the work extended, preachers were appointed. They were of two kinds: clergymen of the Church of England who affiliated with the movement and who were permanent pastors; and laymen, who were itinerants, moving at first every six months and then every year. In its inception Methodism was preëminently an episcopal movement, oversight, as in the Society of Jesus, being reduced to an exact science. Over the classes were the leaders; over both were the preachers, assisted in out-appointments by local preachers, who were laymen with the gift of public address and from whom the itinerants were recruited. Each preacher had his circuit, and several circuit preachers were under a head (whence arose the district and, in North America, the presiding elder). There were quarterly and district conferences and, after 1744, the annual conference, composed of both clergymen and lay preachers. Finally, over the whole movement was Wesley himself, giving it vitality, depth of impression, and breadth of view, saving it from fanaticism on the one hand and laxity on the other, ever guiding and really, though not officially and narrowly, dominating it. A general conference, meeting every four years, arose in the United States after 1792, owing to the great extent of the country.

The relation of the movement to the Church of England is not hard to define. Wesley was a sincere lover of the church of his fathers and hoped that the bishops would ordain his preachers and in some way articulate his results into the normal ecclesiastical life of the country. In this he was disappointed; but, nothing daunted, he went on his way independently, holding that he was justified in this by the unique position he occupied as the providential leader of the movement and consolidating what became a vast ecclesiasticism. Wesley tried to be a loyal churchman as far as circumstances allowed. As a rule he did not hold services in Church hours, nor would he allow lay preachers to administer sacraments. But England's call always sounded louder than the Church's, so that he came to feel that he was serving the Church best when disregarding her most. He invaded parishes constantly and was all the time building a church that had no legal relation to Anglicanism whatever and almost no moral relation. Some of the state clergy persecuted his ministers and members bitterly, others favored them. By the study of the New Testament and early Church history he became convinced that, though only a presbyter in form, he was a real bishop, and therefore ordained clergy whenever he thought best.

After Wesley's death in 1791 the people called Methodists were governed by the Annual Conference, composed of the Legal Hundred, as the lawmaking body, and all the itinerant preachers as advisory and coöperative. The new denomination—as it has been legally since 1784, when Wesley entered a deed into the Court of Chancery constituting the Conference, and as it has been practically since 1740, when the movement separated from both Moravianism and Calvinism—came to be called the Wesleyan Methodist Connection or church. The territory was divided into districts for more efficient supervision, whose interests were looked after by the district meeting, and subdivided into circuits whose affairs were governed by a quarterly meeting composed of ministers, local preachers, and stewards, of whom the two last were appointed by the superintending pastor. Various efforts were made to tone down the hierarchical spirit and constitution of the church by introducing laymen into the annual conference and by giving the local church the right to elect its own officers, but these efforts were successful only at the cost of numerous divisions. Finally, in 1878, the Wesleyan Methodist church introduced the principle of lay representation thus far: that it allowed laymen to sit in the annual conference and deliberate with the ministers on all financial and benevolent causes, those of a pastoral nature being reserved to the clergy. In all the Methodist churches of Great Britain and her colonies there is only one order of ministers.

In 1784 Wesley ordained Thomas Coke (q.v.) superintendent for America, and at the Christmas conference of 1784–85, held in Baltimore, Md., the Methodist Episcopal church was constituted by the ordination of Francis Asbury as superintendent and the drawing up of an episcopal Church constitution. The new overseers assumed the title of Bishop, much to Wesley's disgust, who, out of deference to the Church of England, desired them to be called simply superintendents. But that he considered them to be bishops in the full sense there can be no doubt. In his letter to the conference stating and defending his position he says: "Lord King's account of the Primitive Church convinced me many years ago that bishops and presbyters are of the same order, and consequently have the same right to ordain. For many years I have been importuned to exercise this right"; but he refused out of deference to the established order. In America the case was different. There there were no bishops, so that for hundreds of miles there was no one to administer the sacraments. "Here, therefore, my scruples are at an end, and I conceive myself at full liberty, as I violate no order and invade no man's right by appointing and sending laborers into the harvest." Of course it is understood that the American Methodist episcopacy is in order presbyterial purely, though it is certainly sufficiently Catholic in its powers of supervision, especially in its absolute control over pastoral appointments—a control that is, however, limited in practice when dealing with popular preachers and wealthy

churches. The other of the two orders is that of deacons, who are strictly differentiated from elders. It is, however, a principle of Methodism that no one type of Church order is of exclusive authority, that the Scripture lays down no model, and that therefore a church may exercise liberty in matters of polity if she is true to the spirit and general complexion of the apostolic church. The nonepiscopal Methodist churches are true to Wesley's idea of oversight through their conferences and districts, but presbyterian in ministry and congregational in some features of their administration. A peculiar feature of all Methodist polity is the itinerancy, or the removal of preachers from one charge to another, which is done by the bishops with the advice of the presiding elders in the Methodist Episcopal churches, and by a stationing committee in the other churches. In the Methodist Episcopal church the pastoral limit was placed at two years in 1804, at three in 1864, at five in 1888, and in 1900 the limit was removed entirely. Preachers are now reappointed from year to year by the bishops.

Theology. Few churches have had less doctrinal disturbances than the Methodist. No one has expressed more briefly and admirably the doctrines received by all Methodists than Bishop John H. Vincent: "I. I believe all men are sinners. II. I believe that God the Father loves all men and hates all sin. III. I believe that Jesus Christ died for all men to make possible their salvation from sin, and to make sure the salvation of all who believe in Him. IV. I believe the Holy Spirit is given to all men to enlighten and to incline them to repent of their sins and to believe on the Lord Jesus Christ. V. I believe that all who repent of their sins and believe on the Lord Jesus Christ receive the forgiveness of sin. This is justification. VI. I believe that all who receive the forgiveness of sin are at the same time made new creatures in Christ Jesus. This is regeneration. VII. I believe that all who are made new creatures in Christ Jesus are adopted as the children of God. This is adoption. VIII. I believe that all who are accepted as the children of God may receive the inward assurance of the Holy Spirit to that fact. This is the witness of the Spirit. IX. I believe that all who truly desire and seek it may love God with all their heart and soul, mind and strength, and their neighbors as themselves. This is entire sanctification. X. I believe that all who persevere to the end, and only those, shall be saved in heaven forever." As to the sacraments, Methodism holds that the Lord's Supper is a memorial of Christ's death for the spiritual feeding on him, that he is really present only in the hearts of those who receive him, and that baptism is a sign of a regeneration already accomplished by faith, and as to adults should be given only to believers. Infant baptism is administered to children whose parents desire, if they promise to bring them up in religion, on the ground that the child is already a member of the Kingdom of God. As to atonement, Methodists universally hold to the fact, but are not agreed as to theory. In England the penal substitutionary theory has been held, at least until recently, and that was the common view in America until Professor Miley, of Drew Theological Seminary, published his book on the atonement in 1879, advocating the governmental theory. But it has been the universal conviction of Methodists that a real atonement was paid to God for the sins of the world, though in 1900 Professor Bowne, of Boston, advocated the view that it was an act of love to influence men, holding, however, that the sufferings of Christ bear a "vital and unparalleled relation to the forgiveness of sins." Christ as an object of faith, i.e., his absolute divinity, is held as fundamental, and in fact was one of the driving springs of the movement. Ritschlian views have filtered in among some of the younger ministers, but they are at the farthest pole from historic Methodist testimony. As to depravity, Methodists hold that it is total in the sense that no man is saved except through God's inciting and enabling grace, but not total in the sense of the Reformation creeds. In eschatology opinions differ. Unlike the older Methodists, some hold now to processes of salvation in an intermediate state for those who never heard of Christ. Dr. Pope presented this view in his *Theology* (1875–76), and his book was placed on the course of study for preachers. The natural immortality of the soul has always been maintained, the first dissentient being Professor Beet in his *The Last Things* (1897; 3d ed., enlarged, 1899) and more explicitly in his *Immortality of the Soul: A Protest* (1901). His views were not acceptable to the church, and he was not continued in his professorship. Eternal punishment in some sense is a cardinal tenet. The general view of the final state of the heathen is that all who conscientiously live according to the light which they have received will be saved. It must be remembered that Methodism arose as a religious, not doctrinal, movement, and a narrow orthodoxy is both historically and theologically inconsistent with her genius. She has therefore generally been patient of diverging views, if they have not struck at the vitals of the gospel. For all that, Methodism has had doctrinal standards. In 1769 Wesley, who was legally himself the conference, proposed this test for his preachers: "To preach the Old Methodist Doctrines, and no other, contained in the Minutes of Conference." After 1798 new preachers in England were to be examined in the eight volumes of Wesley's sermons, and later a rigid catechetical examination on the candidate's orthodoxy on such doctrines as the eternal Sonship of Christ was instituted, quite contrary to the spirit of Wesley. Wesley's sermons and notes in the New Testament remain a legal standard in England, though liberally interpreted, and a moral one in America. On theological changes in Methodism, consult Sheldon in *American Journal of Theology*, 1906, pp. 31–52, and Faulkner in *Andover Review*, vol. xviii, pp. 487 ff., and in *New History of Methodism*, 1909, vol. ii, pp. 150 f.

Ethics. Wesley always retained some of the ascetic fervor of his High Church days, and set forth in his "General Rules for the United Societies" (1743) a standard of conduct of a strict and self-denying type. These rules forbade softness and needless self-indulgence, the using of many words in buying or selling, the use of intoxicants as a beverage, and the reading of books or the taking of diversions that could not be indulged in in the name of Jesus. The early Methodists were accordingly noted for their Quaker-like strictness of life, this even showing itself in regard to dress and jewelry; and they resembled the Puritans in their abhorrence of sports and amusements.

Worship. Wesley was attached to the liturgy of the Church of England and drew up for the societies at home and in America a service based on the Prayer Book, which he abridged and changed extensively. This was not adapted to American needs and was never used in America to any extent until recently. It was republished by the Rev. Charles S. Harrower in 1891, and the responsive parts have been widely adopted. But the spirit of Methodism seems opposed to the reading of prayers, and though a modest liturgical service was suggested by the General Conference of the Methodist Episcopal church in 1896, it goes no further than a responsive reading, the Gloria, and the recitation of the Apostle's Creed, and even this is too ritualistic for some churches. In special rites, however, like baptism, marriage, and burial, all Methodists use a prepared service.

HISTORY AND METHODIST DENOMINATIONALISM

England. (For the so-called Calvinistic Methodists, see CALVINISTIC METHODISTS; and for the "Calvinistic Methodist Church" of Wales, see PRESBYTERIANISM. See also METHODIST EPISCOPAL CHURCH, SOUTH; METHODIST PROTESTANT CHURCH.) The paternal absolutism which Wesley exercised and which he left to his legal successors—the Hundred Ministers—could not endure. It was inevitable that the societies would assert their liberties. These liberties had reference to (1) holding service in church hours, which Wesley had opposed out of regard for the Established church; (2) receiving the sacraments in their own chapels from their own ministers; (3) lay representation in the conferences; and (4) the right of the local church to have a voice in the reception and expulsion of members, in the choice of local officers, and in the calling out of candidates for the ministry. All these principles except the last have been incorporated into all types of Methodism, but the honor of being the first to found a society upon them belongs to Alexander Kilham (1762–98). In 1795 Kilham published a pamphlet, *The Progress of Liberty*, which is a landmark in Methodism, as it is the first systematic presentation of the rights of ministers and laymen. For this book and for statements which were interpreted as reflecting on the conference he was expelled in 1796. Three ministers joined themselves to him immediately, and soon 5000 members were enrolled, the body taking the name of the *Methodist New Connection* at the date of its organization in 1797. In theology and polity it is similar to Wesleyan Methodism, except in the principle of representation. It was the first effective effort to adjust Methodism to the nonconformist principle and thus bring it to its logical conclusion.

With the building of chapels there had been a decline in the aggressive zeal of the field-preaching days of original Methodism. In the early part of the nineteenth century news was borne across the Atlantic of the marvelous success of camp meetings as a revival agency, and desire was felt by some to revive open-air meetings in England. Accordingly Hugh Bourne (1772–1852), assisted by William Clowes and other zealous Wesleyan local preachers and exhorters, held a camp meeting at Mow Cap, a hill between Staffordshire and Cheshire, May 13, 1807, and with such favorable results that several similar meetings followed. The parent conference in 1807 passed a resolution severely condemning such meetings, but Bourne persisted in his use of an evangelism so congenial to early Methodism. For this he and his companions were expelled, and in 1810 they organized an independent church, which in 1812 took the title of the *Primitive Methodist Connection*. In polity this body is similar to the New Connection church, except that it has two laymen instead of one to every minister in their conference, and is especially noted for its large use of laymen both in church government and in evangelism. It publishes an able review, the *Holborn Review* and sustains numerous schools and missions and all the appliances of a strong church.

A zealous young Wesleyan, William O'Bryan, felt called to carry the gospel to destitute villages of east Cornwall and west Devon in the early years of the nineteenth century, and had great success in these tours. As this necessarily carried him beyond the bounds of Wesleyan circuits, and as he could not limit his work to their harness, he was expelled for his zealous following of Wesley. In 1815 O'Bryan organized his first society, the work developed, other preachers were received, rules were drawn up in 1818, and in 1819 the first conference was held. His societies came to be called *Bible Christians*, although that was not adopted as the official name until 1828. In 1850 they sent Way and Rowe to Australia, where a strong cause has been built up. They also have missions in China. The polity of the Bible Christians is similar to that of the other bodies of reformed Methodists.

The forcing of an organ on the Brunswick Wesleyan Methodist Chapel in Leeds in 1828 against the wishes of the leaders and stewards caused the withdrawal of more than a thousand members and the formation of the *Wesleyan Protestant Methodists*. The dominating influence of Jabez Bunting (minister 1799–1858), who exercised an autocratic power over the conference, was the indirect cause of the next schism—that over the formation of a theological institution. The opposition to this scheme was led by Dr. Samuel Warren, who was then minister at Manchester and who was expelled in 1835. He was the father of the famous novelist of the same name. Thousands of members sympathized with him and left the church, forming the *Wesleyan Methodist Association*, which in 10 years numbered 21,176 members. Independent speech and action in the conference being impossible under Bunting, an outlet for criticism was found in anonymous publications and periodicals. To find out the authors of these articles strong measures were adopted, and every member of the Wesleyan Methodist conference was subject to a system of rigid questioning. For failure to answer these and other questions James Everett and other ministers of standing were expelled in 1849. The revulsion against these proceedings was equal to that against state control in Scotland six years before. One hundred and twenty thousand members left within three years and the contributions fell off £100,000. This separation helped to swell the nonconformist churches, but many kept up a Methodist organization—generally called the *Wesleyan Reformers*—until 1857, when they united with the *Protestant* (Leeds) and *Association* (Warren) Methodists to form the *United Methodist Free Churches*. This body carries on large missionary and educational work. Its polity is thoroughly representative, and is congre-

gational as to the supremacy of the local church in purely local affairs.

In 1907 the Methodist new connection, the Bible Christians, and the United Methodist Free churches united in one church—the United Methodist church. No substantial change had to be made in the polity. The creed in 12 short articles, though general and liberal, is evangelical and orthodox. The church's headquarters are at 12 Farringdon Avenue, London, E. C., and its publications include the *United Methodist*, the *United Methodist Magazine*, and other literature. It has extensive missions in China, and some in Africa.

Under the charge of English Wesleyan Methodism in 1854 the connectional relief and extension fund was inaugurated, in the same year that the Wesley Chapel fund was established on a new basis, and in 1861 the metropolitan chapel-building fund for the building of 50 new churches in and near London was founded by the gift of £50,000 by Sir Francis Lycett. The Children's Home was established in 1873 by the Rev. Thomas Bowman Stephenson, which has developed into a magnificent charity, with branches in several cities and a house in Canada. In 1873 the Sunday School Union was founded for the extension of that cause. But the most important change is the introduction of laymen into the annual conference since 1878. There are now two sections of the conference—a ministerial for the consideration of matters relating to the clergymen and a mixed section for the financial and other matters in which all are interested. This tardy and partial recognition of laymen has given an impetus to the parent church, seen especially in the munificent gifts for the million-guinea century fund in 1899–1902.

Ireland. In Ireland, Wesley had been preceded by Thomas Williams, who in 1747 gathered a society in Dublin. Wesley came in that same year and was greatly encouraged, and all through the second half of the eighteenth century both English and native itinerants traveled through the country, establishing societies in some towns, but being frequently mobbed, fined, and imprisoned. In the Irish rebellion of 1798 the Methodists were the special objects of Irish wrath and suffered numerous tortures. It was they who saved Dublin from being sacked by timely communication of the intentions of the rebels. The first Irish conference was held in 1752. But Methodism was unable to affect Irish life deeply. The membership has never reached 30,000, and the highest number was, as far back as 1814, 29,388. The Irish were even more insistent on receiving the sacrament at the hands of their own ministers (rather than from the Episcopal church) than the English were, and in this they were favored by Dr. Coke, who frequently presided over the conferences. In January, 1818, the *Primitive Wesleyan Methodist Society* was formed under the leadership of the apostolic Adam Averell, whose banner was "The sacrament from the Established church." The regular Methodist church in Ireland declared for independence. In 1878 the two united.

Scotland. Wesley found Scotland stony ground. He received an attentive hearing, but not much response. Whitefield told him plainly that he had "no business in Scotland." But he persevered and established his societies. The Rev. D. Butler has shown in two interesting studies the influence of Wesley on Scotland and the debt which Wesley himself owed to Scougal's *Life of God in the Soul of Man* (1671), a book that he had reprinted in 1744. Consult Butler, *Wesley and Whitefield in Scotland* (Edinburgh, 1898), and *Henry Scougal and the Oxford Methodists* (Edinburgh, 1899).

France. English soldiers carried Methodism to Jersey in the Channel Islands as early as 1779, and Robert Carr Brackenbury, a wealthy layman, who could speak French, was sent there in response to their converts. Wesley himself spent a fortnight in the islands in 1787, preaching and exhorting from house to house. In 1790 the mainland was invaded, and from that day to this Methodism has always had a foothold in France. In 1818 Charles Cook began his ministry there. Cook died in 1858 and left his two sons to carry on his work. In 1852 France was made a separate conference and the full supervision of the mission was left in her own hands. Some notable men have wrought their lives into French evangelization—Cook and his two sons, Emile F. and Jean Paul, Gallienne, Hocart, and Gibson. One of the best lives of Wesley ever written we owe to this mission, that by J. W. Lelièvre (1868; trans., 1871; new ed., 1900). In 1907 the Methodist Episcopal church started a flourishing work in the Savoy, with centre at Grenoble.

Germany. A young Württemberger, C. G. Müller, went to London in 1805 on business, was converted, became a local preacher, in 1830 returned to south Germany, became a missionary of the Wesleyan conference, and when he died in 1853 left 67 preaching places, 20 local preachers, and 1100 members, chiefly in Württemberg. In 1849 Ludwig S. Jacoby went out from America, and for 50 years English and American Methodism labored in different sections of the German Empire. In 1898 England handed over to the Methodist Episcopal church her missions in Germany and a union was effected.

Italy. In 1852 the French Methodists sent M. Rostan to the Piedmont valleys, who established several stations. In 1861 the Wesleyan Methodist conference in England sent Green and Piggott to Florence, and they soon had flourishing missions in north Italy. In 1872 Leroy M. Vernon began his work in Bologna as representing the Methodist Episcopal church. Further particulars as to European Methodism will be found under *Missions*.

America. The first Methodist society in the New World was recruited from the German refugees to Ireland driven out of the Palatinate by Louis XIV. Two of these, Philip Embury and Barbara Heck, had been converted in Ireland, and upon arriving in New York, in 1760, they began preaching. Thomas Webb, an army captain and local preacher, also preached in New York and elsewhere, and about the same time (1766) Robert Strawbridge, another Irishman, started the work in Maryland, where he was assisted by Robert Williams, who was the apostle of Virginia. In 1769 Wesley sent out Richard Broadman and Joseph Pilmoor, and two years later Francis Asbury and Richard Wright. In 1773 their first conference was held—10 ministers with 1160 members. In spite of the disastrous influence of the Revolutionary War, at its end they had 80 preachers and nearly 15,000 members. Most of the Episcopal clergy had fled, and Wesley tried to get a bishop in England to ordain one of his preachers for America. Failing in this, he concluded that he himself had authority. The societies in America, Wesley said,

"are now at full liberty to follow the Scriptures and the primitive Church, and we judge it best that they should stand fast in that liberty wherewith God has so strangely made them free." He accordingly ordained, Sept. 1, 1784, Whatcoat and Vasey as deacons, on the next day elders, and Coke superintendent. He furnished them with a liturgy and collection of psalms and hymns, articles of religion abridged from the Thirty-nine Articles of the Church of England, and told them to organize the American societies into a church. This was done at the celebrated Christmas conference in Lovely Lane Chapel, Baltimore, Dec. 24, 1784 to Jan. 2, 1785, where Asbury was ordained deacon, elder, and superintendent, the societies taking the name of the *Methodist Episcopal church.*

The catholicity of the new church was shown by Wesley's method in regard to both doctrine and discipline. Everything of a sectarian nature was stricken out of the Thirty-nine Articles, so that as they left Wesley's hands they could be subscribed to by almost any evangelical Christian. Nor did he insert any of his own teachings. His design was to provide a generous platform on which all who loved the Lord could rally. As to discipline, no one mode of baptism was made obligatory, and even rebaptism of such as had scruples of their baptism in infancy was permitted, and although kneeling was recommended on the reception of the Lord's Supper, it was distinctly conceded that it might be received standing or sitting. Nor were people required at first to give up membership in their own church in order to become Methodist; so long as they "complied with our rules" they were to have full liberty of attending their own churches. On the other hand, no one could be admitted to communion but members of the society, or such as had received tickets from the preacher. Members who neglected their class meetings were liable to expulsion, and also members who married "unawakened persons"—rules that have gone by the board long since.

During the national period the growth of Methodism has been extraordinary. Its polity is vigorous yet elastic, and provides for close supervision of all parts of the field. This it does by reviving the apostolate or apostolic episcopate and adapting it to present-day needs. Itineracy has given it the opportunity to meet the immigrant face to face while establishing his family in their new home, and it has thus been able to proclaim the gospel everywhere on American soil. But this would have been impossible without a band of preachers alert, brave, consecrated, self-sacrificing, ready to go anywhere with the message of salvation. Perhaps history has never seen a truer type of home missionary than the itinerant preachers of Methodism. Ready to obey orders like the Jesuits, strong to preach like the Dominicans, they have gone everywhere, threading forests, fording and swimming rivers, making friends with Indians or with chance settlers, traveling through parishes a hundred miles or more in extent, meeting their appointments with the regularity of a machine, running the gauntlet of all kinds of dangers. These men of the first generations of Methodists revived the earliest traditions of Christianity. The emphasis put on preaching has been another cause of success. Necessarily deficient in learning, the preachers made up for that by study (a course of study was early prescribed), reading, and contact with men. But they learned above all to be preachers—ready, powerful, interesting extemporaneous preachers. Emphasis on religious experience, personal knowledge of Christ, and victory over all sin gave both preachers and people a buoyant, triumphant life, and this sense of reality and power invested the pulpit with authority and fascination and its people with a vitalizing influence over others. At a time when the prevailing type of Christianity was Calvinistic the Methodists came with the gospel of a free, full, and present salvation, which they preached with tremendous earnestness and without philosophical refinements. Methodism has therefore been a revival church.

The government of the Methodist Episcopal church was completely in the hands of the preachers, who received their appointments annually from the superintendents, who were thus invested with large legal and indefinite moral power. This excessive clericalism was the occasion of the first two schisms. James O'Kelly, an earnest Irishman of warm piety and strong personality, tried to have the right of appeal to the conference recognized in the case of a preacher who felt oppressed by an appointment by the Bishop, and, failing in this, led a schism in Virginia in 1792. He organized the *Republican Methodist church,* which was finally absorbed by other movements. Of greater significance was the agitation to admit laymen into the church councils, which, being refused by the General Conference of 1824, led to a new church, in 1828. See METHODIST PROTESTANT CHURCH.

To many minds at one time slavery seemed the article of a standing or falling church. At the beginning Methodism had taken strong ground against slavery, but exigencies of the work in the Southern States led to an abandonment of the old ground. The antislavery men of the North would not yield, however, and in 1843 organized the *Wesleyan Methodist Connection* at Utica, N. Y. In government they are similar to the Methodist Protestant church. They hold stricter ground in regard to secret societies, intemperance, and dress, than the old church. This church has its headquarters in Syracuse, N. Y., where it publishes the *Wesleyan Methodist.* It supports missions in Sierra Leone, Kunso, and other unhealthy parts of West Africa. The great division on slavery was that in 1844–45, in connection with the case of Bishop James O. Andrew, who had married a slaveholding wife. (See METHODIST EPISCOPAL CHURCH, SOUTH.) The latest division of consequence was that in western New York in 1860, when the *Free Methodist church* was organized, a reaction towards the strenuous ideals of primitive Methodism in regard to secret societies, plainness of dress, the use of tobacco, and in the interests of positive Christian teaching and practice. It has its headquarters in Chicago, Ill., and North Chili, N. Y., publishes the *Free Methodist,* and supports missions in Africa, India, Japan, and China. It put two new articles in its creed—sanctification and eternal punishment. Other and smaller separations have taken place, prompted by a desire either for a more democratic or for a purer Christianity, or both, the latest being the organization of the *Independent Methodist church* at Newark, N. J., in 1900.

Colored Methodism has had free course in the United States. Housed at first in the parent church, the colored people came out in Philadelphia under Richard Allen in 1816 and organized the *African Methodist Episcopal church.* Four

years later the *African Methodist Episcopal Zion church* was organized in New York. The *Colored Methodist Episcopal church of America* was organized by action of the Methodist Episcopal church, South, Dec. 16, 1870. The Methodist Episcopal church has colored conferences in the South, but she had never elected a colored bishop since the death of Francis Burns in 1863, until 1904, when Scott was elected Missionary Bishop of Africa.

The struggle for the rights of laymen in America has been similar to that in England. The Methodist Episcopal church, South, not only (since 1869) admits laymen to the General Conference in equal numbers, but admits four laymen from every district in the annual conference. The African churches do the same. After the organization of the Methodist Protestant church, 1828–30, the agitation rested in the Methodist Episcopal church until 1852, but it was not until 1872 that that church granted place to laymen in her supreme council, and then only to the extent of two laymen from each annual conference, which gave the preponderance to the ministers three to one. In 1900 the ratio of representation was made equal. In 1912 this church in its General Conference voted down a resolution to admit laymen into the annual conference.

Canada. The Palatines, who did so much for Irish Methodism and who founded the church in the New World, were also the organizers of the first class in Canada—at Augusta, Ontario, in 1778. In fact, it was the same Paul and Barbara Heck, their sons and relatives, and the widow and son of Philip Embury, who constituted that class. George Neal, a school-teacher in the Niagara district, preached to the people on Sunday and on week evenings after 1786, and gathered his converts into classes. He kept up this work for years, but was not ordained until 1810. William Losee was the first itinerant minister. He preached in and around Kingston in 1790 and following years, and in 1791 and thereafter Canada was regularly supplied with ministers from the United States. In 1800 there were one district, four circuits, seven preachers, and 936 members. Relations with the Episcopalians were not always friendly. Canada was a part of the Genesee conference of the Methodist Episcopal church until 1824, when the Canada conference was organized. In 1828 the church was made independent and became the Methodist Episcopal church in Canada. The English Methodists began work in Montreal in 1814, extended it into Ontario in 1818, and took over the Methodist Episcopal church in 1832, though the latter resumed an independent existence in 1834. Methodism in the eastern provinces was founded by the apostolic William Black, a notable figure, who began his work in Nova Scotia in 1782. Other branches of English Methodism were likewise planted in Canada. In 1874 the Wesleyan Methodist church of the Dominion united with the New Connection church, and in 1883 these united with the Methodist Episcopal, Primitive Methodist, and Bible Christian—making one Methodism in Canada. The union has been very successful. A bold attempt was made between 1905 and 1913 to unite in one church the Presbyterians, Congregationalists, and Methodists of Canada, and all doctrinal, ecclesiastical, and legal matters were arranged satisfactorily; but on account of a strong minority of Presbyterians holding out, the union is being held in abeyance as inexpedient for the present. There are also colored churches.

Australia. Two schoolmasters and farmers, who were sent out from England to take charge of the convict schools, established the first class, in Sydney, March 6, 1812. They soon applied for a missionary and in 1815 Samuel Leigh, "the apostle of Australia," landed and took up the work. Others followed, and wonderful success attended their labors, often wrought with heroic self-sacrifice and bravery. In 1820 Methodism went to Tasmania, 1822 to the Friendly Islands, 1823 to New Zealand, 1835 to the Fiji Islands, 1838 to South Australia, and 1839 to Western Australia. In 1854 all the Wesleyan Methodist churches were united in one conference (including New Zealand), and in 1873 those of Tasmania and the South Sea Islands were united with these, making the Australasian church. The Primitive Methodist and other English Methodist denominations were also established in Australia, but in 1900–02 these all united with the Wesleyans, making one Methodism in the South Pacific.

Missions. All the Methodist churches sustain extended missionary operations, but it is impossible here to do justice to their work. A society was gathered in Sierra Leone in 1792, and in 1811 the Wesleyan conference sent George Warren as the first missionary to Africa. Churches have been established among both natives and Europeans, and in 1884 William Taylor opened up the Congo country. Bishop Hartzell has done much towards coördinating the work over a vast territory with the progress of civilization. In 1814 Thomas Coke, with six missionaries, founded the first Methodist missions in Asia, which have realized great results. The American church sent Melville B. Cox to Africa in 1833, and William Butler founded missions in India in 1856, which have recently achieved notable results among the peasants of north India—the natives coming into Christianity faster than they can be cared for. In 1873 Butler also began work in Mexico, where hospitals, schools, and churches have been established. William Taylor also did a great work in India and Bishop James M. Thoburn ranks with William Butler and William Taylor for efficiency, enthusiasm, and influence in India. Numerous missions exist in South America. Scandinavia has proved a good soil for Methodism; even Finland has been entered, and Switzerland has several societies. In 1900 the Methodist Episcopal church made John H. Vincent resident Bishop in Europe, where there are already five conferences. Mission work in China has had marvelous success, considering the circumstances, and various Methodist bodies are working there in harmony. In Japan, efforts have been made to merge the Methodist denominations into a single Japanese church, and in 1906 a union of the Methodist Episcopal church, of the same, South, and of the Methodist church of Canada was effected. In 1900 missionaries were sent to the Philippine Islands. Russia was entered in 1907.

Education. It was not till 1834 that it was decided to open institutions for the training of ministers, and even then amid much opposition, partly on account of fear of loss of the old spirituality, freshness, and independence, and partly on account of the preponderating influence of Bunting. In 1834 an institution was opened at Hoxton, London, removed to Richmond, Surrey, in 1843; another was opened in

Stoke Newington in 1839, merged in the Richmond school in 1843. The Didsbury institution, near Manchester, received students in 1842; that at Headingly, near Leeds, in 1868; that at Handsworth, near Birmingham, in 1891. These schools are both academic and theological, and not on the grade of American theological seminaries. These, as well as Wesley College for boys at Sheffield, the Leys School in Cambridge, and Trinity College, Taunton, are in connection with the Wesleyan Methodist church, which also supports a system of day schools having 159,000 scholars and an annual expenditure of £259,000, with training colleges for teachers in Westminster and Southlands. In Ireland there are Wesley College, Dublin, and the Belfast Methodist College. In Australia and New Zealand there are three theological institutions and ten colleges. The Primitive Methodists have a college for ministers at Manchester, and colleges for youths in York and Birmingham. The United Methodist church has a theological institution at Ranmoor, near Sheffield, opened in 1864, Shebbear College at Highampton, Devon, Ashville College and a girls' school at Edgehill.

FOREIGN COUNTRIES (1914)

DENOMINATION	Ministers	Lay preachers	Church members and probationers	Sunday schools	Officers and teachers	Sunday scholars	Churches, etc.
Wesleyan Methodists:							
Great Britain	2,513	19,463	508,563	7,552	130,167	939,619	8,479
Ireland	250	646	28,116	340	2,448	24,889	606
Foreign missions	681	5,524	166,851	2,050	8,486	116,278	3,844
French conference	41	82	1,715	35	155	2,074	124
South African conference	280	4,300	131,474	818	2,922	40,322	4,022
Primitive Methodists	1,157	15,718	207,356	4,239	57,713	453,430	4,907
United Methodist church	851	6,224	185,486	2,264	41,428	300,075	3,038
Wesleyan Reform Union	26	490	8,519	187	2,694	22,992	207
Independent Methodist churches	411	.....	8,905	159	3,084	26,518	162
Australasian Methodist church	985	8,634	149,878	3,849	21,964	203,365	5,147
New Zealand Methodist church	199	949	23,181	437	3,020	29,141	455
Japan Methodist church	215	.....	14,569	283	1,131	25,980	1,100
Totals	7,609	62,032	1,434,613	22,213	275,212	2,184,683	31,091

In America Cokesbury College was opened at Abingdon, Md., in 1787. After eight years of vicissitudes it was burned. It was rebuilt, but was burned again in 1797. In 1817 an academy was built at Newmarket, N. H., closed Dec. 30, 1823, but opened again at Wilbraham, Mass., Nov. 5, 1825. The oldest academy having a continuous existence is at Kent's Hill, Me., founded in 1821. Cazenovia Seminary, at Cazenovia, N. Y., was founded in 1825. The oldest college is Wesleyan University (1831), at Middletown, Conn. Between 1820 and 1847 academies and colleges furnished all the education received in school in theological branches by candidates for the ministry, and that was meagre, as classical and scientific studies necessarily predominated. There was in fact a deep-seated prejudice against theological schools, lest they should become centres of heresy, as well as deprive men of that spirituality, earnestness, and self-sacrifice which characterized early Methodist preachers. It was not till 1840 that the first theological institution was opened, that at Newbury, Vt., removed to Concord, N. H., in 1847, to Boston in 1867, and incorporated in Boston University in 1871. Garrett Biblical Institute at Evanston, Ill., now in connection with Northwestern University (the largest university in Methodism), began in 1856, and Drew Theological Seminary at Madison, N. J., in 1867. Gammon Theological Seminary, for colored preachers, was founded in South Atlanta, Ga., in 1883. The Methodist Episcopal church has 10 theological institutions, 32 colleges and universities, 34 classical seminaries, besides numerous women's schools, 18 institutions for colored, and 240 of all kinds in foreign fields. A postgraduate university was begun in Washington, D. C., in 1892 by Bishop Hurst, but was not opened for instruction till 1914. (See AMERICAN UNIVERSITY.) There are important schools for classical and theological instruction at Frankfort-on-the-Main and Bareilly, India, and smaller schools in other mis-

UNITED STATES (1914)

NOT INCLUDING EVANGELICAL ASSOCIATION, UNITED EVANGELICAL CHURCH, AND UNITED BRETHREN

DENOMINATION	Ministers	Churches	Communicants
African Methodist Episcopal	5,000	6,000	620,000
African Methodist Episcopal Zion	3,552	3,180	568,608
African Union Methodist Protestant	200	125	4,000
Colored Methodist Episcopal	3,072	3,196	240,798
Congregational Methodist	337	333	15,529
Free Methodist	1,199	1,179	33,828
Independent Methodist	2	2	1,161
Methodist Episcopal	18,881	28,245	3,603,265
Methodist Episcopal, South	7,099	16,691	2,005,707
Methodist Protestant	1,371	2,348	180,382
New Congregational Methodist (1906)	59	35	1,782
Primitive Methodist	70	92	8,210
Reformed Methodist Union Episcopal	40	58	4,000
Union American Methodist Episcopal	170	212	19,000
Wesleyan Methodist	840	675	19,500
Zion Union Apostolic (1906)	33	45	3,059
Total	41,925	62,416	7,328,829

sion fields. The Methodist Episcopal church, South, reports 147 schools and colleges, one of the largest being Vanderbilt University at Nashville, Tenn., with a theological school, organized in 1875. On account of a decision of the courts that Vanderbilt University could not be controlled by the bishops, Asa G. Chandler established the beginnings of a university in Atlanta, Ga., in 1914, to be in more direct relation to the church, of which the theological department is organized. The Methodist Protestant church has colleges at Adrian, Mich. (1859; theological department, 1882); Westminster, Md. (1868; theological department, 1882); and Kansas City, Kans. (1896). The Free Methodists have a college at Greenville, Ill., and seminaries at North Chili, N. Y.; Spring Arbor, Mich.; Orleans, Neb.; Seattle, Wash.; Wessington Springs, S. Dak.; Los Angeles, Cal.; and Evansville, Wis. Canada established an academy at Cobourg, Ontario, in 1836, which was made a college in 1841, the first degree-conferring body in Ontario; a medical faculty was added in 1854, law in 1860, theology in 1871, and the whole (Victoria University) removed to Toronto in 1892. The Wesleyan Theological College, Montreal, was established in 1873, and the Mount Allison College, Sackville, N. B., in 1859. There are several academies and female colleges.

Journalism and Publishing Interests. There are many weekly and monthly periodicals. The *Wesleyan Methodist Mazagine*, London, was established under the name of the *Arminian Magazine* in 1778, the *London Quarterly Review* in 1853, the *Primitive Methodist Quarterly* (now *Holborn Review*) in 1858, the *Methodist Review*, New York, in 1818 (quarterly, 1830; bimonthly, 1885), the *Methodist Review*, Nashville, 1847, and the *Canadian Methodist Quarterly* in 1889 (merged in the *Methodist Magazine*, Toronto, in 1896). The oldest official weekly in American Methodism is the *Christian Advocate* of New York, founded in 1826.

Statistics. According to the latest figures obtainable the statistics of Methodist communicants in Great Britain, Ireland, Australasia, and Canada in 1914 and in the United States in 1914 were as tabulated on page 511.

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METHODIST CHURCH, FREE. See METHODISM.

METHODIST EPISCOPAL CHURCH. See METHODISM.

METHODIST EPISCOPAL CHURCH, SOUTH. The history of the Methodist Episcopal church, South, as an organization separate and distinct from the Methodist Episcopal church, began in 1844, when the church was divided into two branches. For history up to that time, see METHODISM.

The three largest churches of this country (Methodist, Baptist, and Presbyterian) have long been divided into Northern and Southern branches, and it is quite impossible to understand these divisions without a reference to

American slavery. The question the answer to which divided the church and the nation was how to abolish slavery and how to handle the situation while public sentiment was being brought to the point of demanding that the slaves be freed. More and more leading Methodists in the North came to feel that the only way for the church to free itself from responsibility for this evil was to forbid its ministers and members from owning slaves on penalty of excommunication. Southern Methodists were equally sure that if the church took this action it would result in destroying the influence and perhaps the very existence of the church in the slaveholding States, and would certainly bring to a speedy end the great work that was being done by the Methodist church in the South among both slaveholders and their slaves. By 1844 the differences of opinion had become so radical and so irreconcilable that the General Conference authorized a division of the church.

In pursuance of the plan of separation adopted at the General Conference of 1844 representatives of the church chosen by the various annual conferences located in the Southern States met in a convention in Louisville in May, 1845, and with great unanimity organized the Methodist Episcopal church, South. The first quadrennial General Conference of the Methodist Episcopal church, South, convened in Petersburg, Va., in May, 1846, being presided over by Bishop Joshua Soule and Bishop James Osgood Andrew, who had cast in their lot with the Southern church at the time of the division. Rev. William Capers and Rev. Robert Paine were elected to the episcopacy at this conference. This conference took all the steps necessary to put the machinery of the church in running order. About 20 annual conferences and 450,000 communicants fell to the Southern church under the plan of division.

The Articles of Religion, 25 in number, which constitute the basis of Methodist theology in so far as it is in common with that of other Protestant churches, were taken from the Thirty-nine Articles of the Church of England. Among the doctrines peculiarly characteristic of Methodist faith and most emphasized in Methodist preaching may be mentioned the Fatherhood of God, the unlimited atonement of Jesus Christ, the moral free agency and accountability of man, the witness of the Holy Spirit testifying to the regenerate believer of his acceptance with God, the possibility of apostasy, and the attainability by grace of entire holiness. These doctrines are in the published sermons of John Wesley, which are recognized as doctrinal standards, legal or moral, in all branches of Methodism. The preaching of this evangelical type of theology has made Methodism intensely evangelistic, and no branch of world-wide Methodism has shown happier results from the preaching of these doctrines than the Methodist Episcopal church, South.

The most characteristic feature of the polity of the Methodist Episcopal church, South, is the "conference." The work of the church is done largely through its various conferences, of which there are five, as follows: 1. *The Church Conference*, composed of all the members of any local church. 2. *The Quarterly Conference*, which meets four times a year and is composed of the pastor in charge of the church and all the male members of the church holding an official position, such as stewards, trustees, class leaders, superintendents of Sunday school, etc. It attends to all the business affairs of the pastoral charge. The presiding elder is ex-officio chairman of the quarterly conference. 3. *The District Conference*, which meets but once a year and is composed of all pastors having charges in the district and residing within the district and of all local preachers and certain lay delegates elected by each quarterly conference. The district conferences have on an average some 20 or more pastoral charges in them. 4. *The Annual Conference* meets once a year, as the name indicates, is composed of all traveling preachers living and working in its bounds and of certain lay delegates elected annually by the district conferences, and is presided over by a bishop. The bishops meet in May of each year and distribute the annual conferences among themselves, each bishop as a rule having from three to six conferences to preside over. 5. *The General Conference* meets quadrennially and is composed of an equal number of clerical and lay delegates elected by the various annual conferences, the number of delegates which each annual conference is entitled to being determined by its size. The General Conference is the one and only lawmaking body of the church. It is presided over by the bishops in turn. It elects quadrennially the general agents, secretaries, editors, etc., and also elects from time to time as many bishops as may be needed for the general superintendency of the church.

The second most characteristic feature of Methodist church polity is its itinerant ministry. Preachers are distinguished as local and itinerant or traveling. Every traveling preacher must belong to an annual conference and receive his appointment from the presiding bishop annually. A traveling preacher is supposed to give his whole time to the work of the Christian ministry and to receive his support from the church in return for his labor. A local preacher, on the other hand, chooses his own vocation and supports himself, but is supposed to preach only so often as opportunity offers and as he may find it convenient to do so. A traveling preacher cannot be returned to the same pastoral charge more than four successive years. The itinerant system gives every effective traveling preacher a pastoral charge every year and supplies every pastoral charge with a preacher. Bishops hold office for life. They choose their own places of residence, but each bishop receives from his colleagues annually his assignment of annual conferences over which he is to preside for the year.

The general direction of the more important interests of the church is committed to certain "connectional boards," the members and executive officers of which are elected quadrennially by the General Conference. The interests committed to these connectional boards are as follows: (1) Sunday schools; (2) home and foreign missions; (3) education; (4) church extension; (5) young people's organization known as the Epworth League; (6) the board having charge of the publishing interests is known as the Book Committee. The leading publishing house of the church is located in Nashville, Tenn., with branch houses in Dallas, Tex., and Richmond, Va. It is the largest publishing house in the Southern States. All the connectional boards have their headquarters in the publishing house at Nashville, Tenn., except the Church Extension Board, which is located in

Louisville, Ky. The one official volume of the church called *The Doctrines and Discipline of the Methodist Episcopal Church, South*, is published quadrennially, immediately following the General Conference, which body alone has power to alter it. Among the important and influential periodicals issued by the publishing house may be mentioned the *Methodist Review*, published quarterly, and the *Christian Advocate*, issued weekly, while each of the above boards issues a publication devoted mainly to its own interests. The literature of the Sunday-school department is very widely circulated. Most of the annual conferences have well-equipped colleges both for men and for women. The church has recently established theological seminaries at Atlanta, Ga., and Dallas, Tex. There are successful missions in Mexico, Cuba, Brazil, Japan, China, and Korea, with a total membership in all these fields of over 30,000. For figures, see METHODISM.

Organic Union. In 1915 negotiations were under way between the Methodist Episcopal church, the Methodist Episcopal church, South, and the Methodist Protestant church, looking towards the organic union of all three of these churches in one organization which will probably bear the name of the Methodist Church of America.

METHODIST NEW CONNECTION. See METHODISM.

METHODIST PROTESTANT CHURCH. Instituted in 1828 and organized under its present title in 1830, this church traces its origin through the Methodist Episcopal church, back to the Evangelical Reformation begun in England by John and Charles Wesley, of Oxford University, and presbyters of the Church of England. The separation from the mother church grew out of the controversy for the rights of the laity in the lawmaking councils of the church. After years of desultory discussion William S. Stockton began the publication of the *Wesleyan Repository*, which was intended to provide a medium for the more formal examination of what came to be called "the mutual rights of the ministry and laity" and to spread abroad the views of leading ministers and laymen on the subject. This publication was followed in 1824 by a publication called *The Mutual Rights of Ministers and Members of the Methodist Episcopal Church*, with the same general object in view. The views of the reformers were embodied in a formal petition to the General Conference of 1824, but in a curt reply the bishops denied this right of petition. This was followed by the organization of union societies, whose object was to unite the reformers and present to the ensuing General Conference a petition that would obviate the objection made at the previous conference that the reformers were merely scattered agitators with conflicting aims and uncertain objects. In 1827 a general convention of reformers was held in Baltimore, composed of 100 delegates from seven different States, who prepared a memorial to be presented to the next General Conference, praying for the admission of laymen into the legislative councils of the church. After three weeks of deliberation the memorial was denied. This seemed to put an end to the resources of peaceable reform. The protestants again and again professed their loyalty to the church and their strong desire to remain in its communion, but they were soon threatened with expulsion. They were charged with breaking the General Rules of Wesley which forbid "speaking evil of magistrates and ministers." One of the leaders of that day voiced the sentiment of those who opposed the contention of the reformers. "You publish," he said, "the Mutual Rights, and say you will not discontinue that publication. You also say you will not withdraw from the Methodist Episcopal church. Now we are reduced to one of two alternatives, either to let you continue to agitate the church or to expel you." At no time was there a charge of heresy or immorality brought against the reformers. On the other hand, they had been the cherished friends of many of the foremost men in the church, including Bishop Asbury himself.

Those who were expelled were left no alternative but to organize another branch of Methodism. They had no contention with Methodism, but they could not consent to the suppression of their convictions and the privilege of expressing them. They did not object to the episcopacy, but they did protest against the exercise of arbitrary episcopal authority. They sorrowfully took up the task of organizing a Methodist church in conformity with the fundamental principles which Protestantism had bequeathed to the world, and they sought to express these ideas in the name they gave the church. The church was organized without the change of a single word in the doctrines of Methodism. In polity a presbyterial form of government was chosen. The itinerant system for stationing ministers was retained, but ministers were given the right of appeal from the stationing authority if for any reason they thought themselves afflicted by their appointment. There is only one order of ministers recognized in the church. The presiding officers of the conferences are elected every year, though they may be reëlected. It has often been said that there is now little difference between the two Methodisms. The fact is that the real difference is just as great as it ever was, though it is pleasant to note that the differences are no longer a cause of bitterness and bad feeling. The real difference is this: in the Methodist Episcopal church the unit of power is in the bishops; in the Methodist Protestant church the unit of power is in the laity. The laymen, in equal numbers, share in every legislative action and in every election of the church. The church was formally organized in 1830. It now has 32 conferences, 16 mission conferences, 1551 ministers, 648 local preachers, 191,300 members, and church property valued at $7,589,576. It has a well-organized conference in Japan and some mission work in China. It has five colleges and one theological seminary, and has organized boards of missions, education, church extension, and preachers' aid. See METHODISM.

METHO'DIUS (also called EUBULIUS) (?–c. 311). A Greek theologian of the third century, a martyr and Church father. He was Bishop of Olympus in Lycia and perhaps of Tyre. He was a contemporary of Porphyry and suffered martyrdom about 311. Epiphanius calls him "a very learned man and a strenuous asserter of the truth," but he is not mentioned by Eusebius. He vigorously opposed Origen. Of his numerous works, which are mostly dialogues, several exist complete either in Greek or Syriac, the most important being the *Symposium*, a Christian counterpart to Plato's *Symposium*. It is in Migne, *Patrol. Græca*, xviii, and has been edited by Bonwetsch (Leip-

zig, 1891); there is an English translation in the *Ante-Nicene Fathers* (vol. vi). Consult Adolf Harnack, *Geschichte der altchristlichen Litteratur* (Leipzig, 1893), and Bonwetsch, *Die Theologie des Methodius von Olympus* (Berlin, 1903).

METHODIUS. The apostle to the Slavs. See CYRIL AND METHODIUS.

METHOD OF AGREEMENT, OF CONCOMITANT VARIATIONS, OF DIFFERENCE, AND OF RESIDUES, IN LOGIC. See INDUCTION.

METHOD OF CHARACTERISTICS. See CHARACTERISTIC.

METHOD OF EXHAUSTIONS. See EXHAUSTIONS.

METHOD OF LEAST SQUARES. See LEAST SQUARES, METHOD OF.

METHOW. See SALISHAN STOCK.

METHUEN, mē-thū'en. A town in Essex Co., Mass., 30 miles north of Boston, on the Spicket and Merrimac rivers and on the Boston and Maine Railroad (Map: Massachusetts, E 2). It is a beautiful residential town, and has the Nevins Memorial Library, a fine high-school building, and the Nevins Home for Aged and Incurables. There are manufactures of cotton and woolen goods, yarns, etc. The government is administered by town meetings. There are municipal water works. First settled about 1641, Methuen was part of Haverhill until 1725, when it was incorporated as a separate town. Pop., 1900, 7512; 1910, 11,448; 1914 (U. S. est.), 13,123; 1920, 15,189.

METHUEN, měth'ū-en, PAUL SANFORD, third BARON (1845–). An English field marshal, born at Nynehead, Somersetshire, and educated at Eton. He entered the army in 1864 as lieutenant of the Scots Guards; served in the second campaign of the Ashanti War in 1874, and after four years as attaché in Berlin became assistant adjutant general for the Home District in 1881. In the Egyptian War (1882) he was staff officer and quartermaster-general, and in Bechuanaland in 1884–85 he won a C.M.G. From 1892 to 1897 he was commander of the Home District, and on the outbreak of the Boer War was put at the head of the first of Buller's three divisions, to relieve Kimberley. He was entirely unsuccessful in this attempt, being severely checked and wounded at Modder River, and, a week after, Nov. 30, 1899, losing in a frontal attack on Magersfontein nearly 1000 men. He retired to Modder River. Methuen, together with Hunter, formed the left in Lord Roberts's victorious movement on Pretoria in May and June, 1900. In March, 1902, he was captured by De la Rey and Kemp on the way from Vryburg to Lichtenburg. The troops were almost immediately released, and with them Lord Methuen, who had been wounded in the brief engagement. He was commander in chief of the Eastern Command in 1903–08, was general officer commanding in chief in South Africa in 1907–09, and in 1909 was Governor of Natal. In 1910 he was made G.C.V.O., and in 1911 field marshal.

METHUEN TREATY. A treaty concluded May 16, 1703, between England and Portugal. Soon after the outbreak of the War of the Spanish Succession Portugal agreed to support England against France, and hence a formal treaty was negotiated by Sir Paul Methuen, the English Ambassador at Lisbon, by which Portugal was to furnish 28,000 troops; but of these the maritime Powers were to provide maintenance and payment for 13,000, and a force of 12,000 Dutch and English was to protect the Portuguese harbors. Politically this treaty had the effect of making Portugal the devoted political adherent of England for more than a century. In its commercial aspects the treaty is almost still more interesting. The wines of Portugal were to be admitted into England upon the payment of a duty 33½ per cent less than the duty paid upon French wines. For this England received proportionate advantages. The result was that for generations the English gentry were addicted to the drinking of port, the Portuguese wine.

METHU'SELAH. According to Gen. v. 21 ff., son of Enoch, grandson of Jared, and father of Lamech, of the line of the Sethites, who attained to the age of 969 years. In Gen. iv. 18 the name of Lamech's father appears as Methushael, and he is represented as the grandson of Irad, and great-grandson of Enoch, who is here son of Cain. The similarities are so striking that many scholars regard the two lists as only variants of one original genealogy. Methuselah is composed of two elements, *Methu*, 'man,' and *Shelaḥ*, probably the name of a deity; Methushael seems to mean 'man of God.' Two Babylonian lists of antediluvian kings are known to exist. One of them is quoted from Berosus by Eusebius (ed. Schoene, pp. 7 ff., 31 f.). It gives 10 names. The eighth is *'Αμέμψινος, Amempsinos*, which probably corresponds to an Akkadian *Amel Sin*, 'man of Sin.' This name actually occurs as that of an ancient sage or king in cuneiform inscriptions cited by Zimmern. *Mutu-sha-ili Sin*, 'man of the god Sin,' would be a variant of this name, corresponding exactly with Methushael, if the proper name of the Babylonian god is dropped, as it naturally would be by the Hebrew writer. Shelaḥ, which also occurs in Gen. x. 24, may have been another name for the moon god Sin. Of the other Babylonian list, written in the Sumerian language, we have as yet only a preliminary account by Langdon. It apparently begins with a creation story, gives the names of 10 antediluvian patriarchs, or kings, and then narrates the coming of the deluge whose hero is Tagtug, a name corresponding in meaning to Noah, according to Langdon and Sayce. Consult Hommel in *Proceedings of the Society of Biblical Archæology*, vol. xv (London, 1892–93); Zimmern in Schrader, *Die Keilinschriften und das Alte Testament* (Berlin, 1902); Stephen Langdon, also A. H. Sayce, in *Proceedings of the Society of Biblical Archæology*, vol. xxvii (London, 1914).

METH'Y. The burbot (q.v.).

METH'YL (from Gk. *μέθυ, methy*, mead + *ὕλη, hylē*, wood), CH_3. The simplest univalent radicle found in carbon compounds. See CARBON COMPOUNDS; CHEMISTRY (historical section); TRIPHENYL-METHYL; VALENCY.

METHYL ALCOHOL, WOOD ALCOHOL, or PYROXYLIC SPIRIT, CH_3OH. A colorless liquid having a peculiar aromatic odor. It boils at 64.96° C. (148.93° F.) and mixes with water in all proportions. It is largely used in the manufacture of varnishes and for the preparation of "methylated spirit" (q.v.). Methyl alcohol is one of the products obtained when wood is heated in retorts, out of contact with the air. It is contained in the aqueous portion of the distillate, mixed with pyroligneous (crude acetic) acid, ammonia, acetone, etc. To separate the acid, the mixture is neutralized with slaked lime

and distilled, the acid then remaining fixed as calcium acetate. Ammonia may be eliminated in a similar manner, by adding sulphuric acid and distilling. Further, to separate the alcohol from acetone (which is especially objectionable if the alcohol is to be used in the manufacture of aniline dyes), oxalic acid may be added to the mixture and a gentle heat applied. Methyl alcohol, when brought in contact with oxalic acid, forms the crystalline solid substance called methyl oxalate, while acetone does not react with oxalic acid, and remains in solution. After separating the solid methyl oxalate from the remaining liquid, methyl alcohol may be reobtained from it by dissolving in potash and distilling. Finally, the alcohol may be freed from water and any remaining impurity by rectification over quicklime. Pure methyl alcohol may also be distilled from commercial wood spirit after the addition of one-tenth of its weight of iodine and just enough caustic soda to decolorize the solution: all the ordinary impurities of wood spirit are thus converted into iodoform. Methyl alcohol forms double compounds with a number of inorganic salts, such as the chlorides of lithium, calcium, and magnesium, and, as Loeb has shown, with the iodide of sodium. When taken into the stomach, wood alcohol acts as a violent poison. A peculiar feature of its toxic action is that a dose insufficient to cause death may cause complete blindness. Methyl alcohol was discovered by Boyle in 1661.

METHYLATED SPIRIT. Ethyl alcohol, or spirit of wine, to which methyl (wood) alcohol has been added to render it unfit for use in beverages. It is used as a cheap substitute for ethyl alcohol, since the manufacture of ordinary alcohol is heavily taxed by most governments. In 1907 the United States, following the example of other countries, removed the tax from alcohol properly denatured or made unfit for drinking, and as the tax of $1.10 per proof gallon (alcohol ½ gal., water ½ gal.) was 10 times the cost of production, a great saving to users and a great extension of the use of alcohol resulted (see FUEL). The formula for the legally denatured or methylated alcohol is 100 parts ethyl alcohol, not less than 90 per cent pure, 10 parts of wood spirits, and ½ part of benzine. This mixture is almost as suitable for general use as a solvent or fuel in burners or engines as pure ethyl alcohol. In cases where this mixture is not suitable, such as the manufacture of certain chemicals and drugs, the law allows the manufacturer to obtain permission to use special denaturants.

METH'YLENE BLUE. An aniline dye, occurring in the form of a bluish, finely crystalline powder with a bronzelike lustre. It is slightly soluble in water, and much more freely upon the addition of alcohol. It is largely used as a stain for pathological and normal tissues and for specimens of blood. It has proved of some value in the treatment of gonorrhœa, and claims are made for it as a substitute for quinine in malaria. See COAL-TAR COLORS.

METHYLENE (from *methyl*) **DICHLORIDE,** or DICHLOROMETHANE, CH_2Cl_2. A chemical compound of carbon, hydrogen, and chlorine. It can be obtained by the direct action of chlorine gas on methane (marsh gas), or by the action of nascent hydrogen on chloroform. It is a colorless heavy liquid, having a chloroform-like odor and boiling at 40° C. (104° F.). It is a powerful anæsthetic, and has been used as a substitute for chloroform. Its effect on the organism is more even than that of similar anæsthetics. When treated with a methyl-alcoholic solution of ammonia, it is converted into hexamethylene tetramine.

METHYL PYROCATECHIN. See COAL-TAR COLORS; GUAIACOL.

ME'TIS (Lat., from Gk. Μῆτις, counsel). The daughter of Oceanus and Tethys and first wife of Zeus, who devoured her in the fear that the son whom she should bear would be more powerful than himself; from the head of Zeus then sprang the goddess Athena.

METIUS, mā'tē-ŭs, ADRIAAN (1571–1635). A Dutch geometer, born at Alkmaar. The name Metius seems to have been a nickname which he received as a student, but which he kept and which, on account of his prominence, was adopted by his brothers and his father. The latter's name was Adriaan, and hence Metius is also known as Adriaan Adriaanszoon. He studied law and medicine, but later devoted his attention to astronomy, and from 1598 until his death was professor of mathematics at the University of Franeker. His mathematical works include: *Doctrinæ Sphæricæ Libri* (1598); *Astronomiæ Universæ Institutiones* (1605; 2d ed., 1630); *Praxis Nova Geometrica* (1623); *Problemata Astronomica* (1625); *Calendarium Perpetuum* (1627); *Opera Astronomica* (1633); *Arithmeticæ Libri 2, et Geometriæ Libri 6 . . . Trigonometriæ Planorum Methodus* (1626); *De Genuino Utriusque Globi Tractatus* (1624); *Primum Mobile Astronomice, etc.* (1631; 2d ed., 1632–33).

METLAKAHTLA, mĕt'lâ-kä'tlâ (properly *Matlakhatla*). A mission settlement of Chimesyân or Tsimshiân Indians, on Annette Island, southern Alaska, made a reservation by Act of Congress, March 3, 1896 (Map: Alaska, O 8). The original settlement was some 70 miles farther south, below Port Simpson, on the mainland of British Columbia. Here the Episcopal missionary William Duncan in 1862 established a mission, which within a few months was joined by the whole body of Indians residing near Port Simpson, and prospered so rapidly that in 1886 it had developed into a town of 1500 civilized Indians, with two-story houses, regular streets, a salmon cannery, saw mill, etc., and one of the largest churches in British Columbia. An extensive shawl-weaving industry was also carried on. Unfortunately the British government permitted the imposition of religious and other unacceptable restrictions on the mission, with the result that almost the entire settlement, led by Duncan, abandoned the place and established themselves in 1887 at the present location in United States territory, where they continue to maintain their advanced civilization. Although many of the natives established independent homes outside of the reservation, the colony numbered 602 souls in 1910. In 1913 the United States Bureau of Education, at the request of many of the Indians, opened a government school, which is in part supported by the natives. Consult H. S. Welcome, *Story of Metlakahtla* (New York, 1887), and K. J. Arctander, *Apostle of Alaska* (ib., 1909).

METON'IC CYCLE (so called from its inventor, Meton, who flourished at Athens about 432 B.C.). A cycle of 19 years of 235 lunar months, or 6940 days, at the end of which time the new moon falls on the same day of

the year as it did at the beginning of the cycle, and eclipses recur in nearly the same order. This arises from the circumstance that 19 solar years are nearly equal to 235 lunations, their average values being 6939.68835 and 6939.60249 days respectively. As the Greek states reckoned by lunar months, and on this reckoning depended the recurrence of many religious festivals, while on the other hand certain other rites were connected with the recurrence of the seasons, there was a constant effort to bring the solar year (365 days, 5 hours, 48 minutes, 46 seconds) into accord with the period of 12 lunar months (354 days, 8 hours, 48 minutes, 33.6 seconds). Before Meton the favorite cycle was the Octaëteris (or, as it was sometimes called, Enneateris), of eight years with three intercalary months of 30 days. The inaccuracy thus arising was removed by Meton, who in the period of 19 years inserted seven intercalary months, of which five had 30 and two had 29 days. They were inserted in the 3d, 6th, 8th, 11th, 14th, 17th, and 19th years. The slight inaccuracy that remained was reduced by Callippus about a century later, by combining four Metonic periods into a "great year" of 76 calendar years and omitting one day in the intercalation, obtaining 27,759 days. The details of Meton's cycle are not very clear and there is considerable difference of opinion among scholars in regard to them. Unger places the beginning of Meton's cycle on July 16, 432 B.C.; Oppert on July 28, 433 B.C. It is agreed that the Callippic cycle began June 29, 330 B.C. The Attic calendar, as laid down by Unger, is as follows:

YEAR OF THE CYCLE

MONTHS	I	II	III	IV	V	VI	VII	VIII	IX	X
Hecatombeon	30	29	30	30	29	29	29	30	29	30
Metageitnion	30	30	29	29	30	30	30	29	30	30
Boedromion	29	29	30	30	29	29	29	30	30	29
Pyanepsion	30	30	29	29	30	30	30	29	29	30
Memacterion	29	30	30	30	29	30	29	30	30	29
Poseideon	30	29	29	29	30	29	30	29	29	30
Poseideon II (in leap years)	..	..	30	..	..	30	..	30	..	..
Gamelion	29	30	29	30	29	29	30	29	30	29
Anthesterion	30	29	30	29	30	30	29	30	29	30
Elaphebolion	29	30	30	30	29	29	30	29	30	29
Munychion	30	29	29	29	30	30	29	30	29	30
Thargelion	29	30	30	30	29	29	30	29	30	29
Scirophorion	30	29	29	30	30	30	29	30	29	30
Number of days in a year	355	354	384	355	354	384	354	384	354	355

MONTHS	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX
Hecatombeon	29	29	30	30	30	29	30	30	30
Metageitnion	30	30	29	30	29	30	29	29	29
Boedromion	29	29	30	29	30	29	30	30	30
Pyanepsion	30	30	29	30	30	30	29	29	30
Memacterion	29	29	30	29	29	29	30	30	29
Poseideon	30	30	29	30	30	30	29	29	30
Poseideon II (in leap years)	30	..	..	29	..	..	30	..	29
Gamelion	29	29	30	30	29	29	29	30	30
Anthesterion	30	30	29	29	30	30	30	29	29
Elaphebolion	29	30	30	30	30	30	29	30	30
Munychion	30	29	29	29	30	29	30	29	29
Thargelion	29	30	30	30	29	30	30	30	30
Scirophorion	30	29	29	29	30	29	29	29	29
Number of days in a year	384	354	354	384	355	354	384	354	384

Bibliography. Ideler, *Handbuch der Chronologie* (Berlin, 1825–26); Boeckh, *Zur Geschichte der Mondcyclen der Hellenen* (Leipzig, 1855); id., *Ueber die vierjährigen Sonnenkreise der Alten* (Berlin, 1863); A. Mommsen, *Chronologie* (Leipzig, 1883); A. Schmidt, *Handbuch der griechischen Chronologie* (ib., 1888); Unger, "Zeitrechnung der Griechen und Römer," in Müller's *Handbuch der klassischen Altertumswissenschaft*, vol. i (Munich, 1892); Oppert, in *Compte rendu de l'Académie des Inscriptions et Belles-Lettres* (Paris, 1898). See CALENDAR, first paragraph, at end; GOLDEN NUMBER.

METON'YMY (Gk. μετωνυμία, *metōnumia*, change of name). A figure of rhetoric by which one thing is put for another to which it bears an important relation, as a part for the whole, the effect for the cause, the abstract for the concrete, etc. For example, "*Lying lips* are an abomination to the Lord."

METOPE, mĕt'ō-pē (Lat. *metopa*, from Gk. μετόπη, *metopē*, space between beam ends, from μετά, *meta*, between + ὀπή, *opē*, aperture). The space between the triglyphs (see TRIGLYPH) in the frieze (q.v.) of the Doric order. As this space in the developed Greek architecture is always filled by a slab, usually relatively thin, the name is generally applied to the slab. This was often decorated with sculpture in high relief, as in the Parthenon (q.v.), at Olympia (q.v.), and at Selinus (q.v.), or with painting. Even where sculpture was used, the background and the relief seem to have been painted in contrasting colors. Consult E. A. Gardner, *A Handbook of Greek Sculpture* (London, 1911), and P. Gardner, *The Principles of Greek Art* (ib., 1914).

ME'TRE. In music, the division of a composition into parts whose rhythm is similar and whose time is equal. The smallest element in metre is the *measure* (q.v.); a *section* comprises two measures, and two sections make a *phrase*. The largest division is the *period*, which consists of two phrases. Theoretically metre differs from rhythm in that the latter deals with accents and

with actual and typical patterns which metre arranges in groups in accordance with their time-value. But this definition is not universally accepted, and exactly *opposite* significations are often given to the two terms.

METRE. A designation applied without great precision to measured or rhythmic language called verse; also the rhythmical measure of verse. In those languages whose versification depends not only on the number of feet in a line, but also on the length of the syllable or syllables in each foot, metre designates both the character of the line as a whole and that of the feet composing the line. This is true, e.g., of Latin and of Greek. In such languages as do not depend on the length of individual syllables for their verse systems, metre applies to the number of stresses or beats in a line, or on the number of counted syllables. This is true, e.g., of the Germanic and the Romance languages, although attempts have been made to employ long and short syllables as in the ancient languages. See VERSIFICATION.

MET'RICAL FOOT. In versification, the designation of the rhythmical unit in a verse. In Greek or Latin poetry this unit may be composed of one or more syllables, all long, or short and long, in various arrangements, as the *spondee, dactyl, anapæst,* etc. In the Germanic and Romance languages the unit may be a single stressed syllable, or a combination of a stressed and one or more unstressed syllables. The metrical foot is marked here not by quantity of individual syllables, but simply by this accentuation or stressing, which corresponds with the regular accentual system of the language, and not necessarily, as in Greek or Roman poetry, with a long syllable. See VERSIFICATION.

MET'RIC SYSTEM (from Lat. *metrum,* from Gk. *μέτρον, metron,* measure, from *μετρεῖν, metrein,* to measure). A system of weights and measures invented by the French in the latter part of the eighteenth century. From earliest times, civilized people have possessed two ideas concerning their standards of weights and measures: that they should be invariable, and that their prototype should be found in nature. From the earliest times great diversity in the kinds of units and in the size of the same units has always characterized systems of measures. As early as 1558 Henry II tried to correct the standard units of France, and a Gabriel Mouton, vicar of St. Paul at Lyons, proposed in 1670 a comprehensive decimal system remarkably similar to the metric system of to-day, while other propositions were made for scientific and natural weights and measures in France. But not until 1790 did the French government undertake the making of a new system. For this purpose a committee of the Academy of Sciences was appointed under the authority of the National Assembly and sanctioned by Louis XVI, and an interesting feature of the plan was that Great Britain also should concur in the determination of a natural unit of weights and measures. The committee consisted of Borda, Lagrange, Laplace, Monge, and Condorcet. Of the three linear bases proposed, the length of a seconds pendulum, a quadrant of the terrestrial equator, and a quadrant of a terrestrial meridian, the committee reported in favor of the last, one ten-millionth of which should be the standard unit of linear measure. Delambre and Méchain were appointed to measure the meridional distance from Dunkirk to Barcelona, the same task which Cassini had undertaken in 1669. This work, difficult in itself, was made the more so by the political revolutions of the times, and required seven years for its completion. The finally computed length of the terrestrial quadrant was in part verified by a comparison with a similar result found by Bouguer and La Condamine in Peru (1736). The length, expressed in English measure, is 32,808,992 feet. Sir John Herschel later estimated the quadrant to be 32,813,000 feet, which made the meter $\frac{1}{208}$ of an inch shorter than one ten-millionth of a meridional quadrant. In 1793 a temporary commission of 12 was appointed, with Borda as president, to make a comparison of all the units then used in France, and to determine the kinds and composition of the metals to be used in constructing the new standard units, their forms of construction, and finally the place and means of their preservation. In 1798 the European states were invited to send representatives to a conference at Paris, the object being to examine the work executed during the preceding eight years by the various commissions. Nine states responded. Their delegates, together with the 10 French commissioners, were divided into committees, which reviewed the work so far accomplished.

On June 22, 1799, the standard units, the meter and kilogram, duly made by expert scientists and instrument makers, were presented to the Council of Five Hundred, and deposited in the archives at Paris. In December of the same year the Council adopted these standards. The use of the new system, however, was not made obligatory in all departments until 1837.

The hope of the inventors of the metric system, that it would become the universal system of all civilized nations, seems likely to be realized, for its use has been made obligatory in Germany, Austria-Hungary, Belgium, Brazil, Chile, Argentina, Spain, France, Greece, Italy, Mexico, the Netherlands, Peru, Portugal, Rumania, Servia, Norway and Sweden, Switzerland, Bulgaria, Siam, and Uruguay; its use has been legalized in Egypt, the United States, Great Britain, Japan, Russia, Turkey, Bolivia, Canada, China, Paraguay, and Venezuela. Several attempts have been made to introduce the metric system in the United States or to adopt a similar system. On Jan. 15, 1790, Congress ordered the Secretary of State, Thomas Jefferson, to prepare a uniform system of weights and measures. Jefferson, who had been Minister to France, reported, on July 14, a system founded on the length of a seconds pendulum in the mean latitude of the United States (38°), or in the latitude of 45°. But the English system was not disturbed. Again, in 1821, Congress sought to revise the system of weights and measures, and John Quincy Adams, Secretary of State, recommended in the strongest terms the adoption of the metric system.

In 1866 the law which made the metric system legal in the United States was passed, and the meter was legally and officially defined as equivalent to 39.37 inches, from which conversely by reference to the international standard of length the customary units of length in the United States are now derived. The same legislation directed that the 5-cent piece should weigh five grams and have a diameter of two centimeters; that the unit for weighing letters in post offices should be the gram. But these

details were imperfectly carried out. The use of units in electrical engineering, based on the metric system, was determined by the law of 1894. Bills have been introduced to the House of Representatives several times, proposing to make the metric system obligatory. Although compulsory legislation may not be immediate in the United States, the adoption of the metric system is constantly extending, as shown by its use in weighing foreign mail matter, in weighing at the mints, in certain government publications, in the Pharmacopœia and the Dispensatory, in base measurements and the computations of the Coast and Geodetic Survey, and in much of the work of the arts and sciences, especially in electrical engineering.

The basal units of the metric system are: for length the meter, for small surfaces the square meter, for area of land the square dekameter (or are), for volume the cubic meter, for capacity the liter, and for weight the gram. The scale selected for the multiples and subdivisions of the various units is 10. The prefixes used to designate the multiples of the measuring unit are deka (10), hekto (100), kilo (1000), and myria (10,000), all from the Greek, and those used to designate subdivisions are deci (0.1), centi (0.01), and milli (0.001), from the Latin.

The ratio between the successive denominations in the system of linear measure, of weight, of capacity, and of money is 10, the ratio between the successive denominations of surface measure is 100, and that of cubic measure is 1000. The unit of capacity, the liter, is equal to a cubic decimeter, and approximately so to the volume of a kilogram of water at the maximum density. Its equivalent is 1.05671 liquid quarts (United States) or 0.8799 liquid quart (British). The unit of weight, the gram, is the mass weight of one cubic centimeter of water, standard pure, at the maximum density. Its equivalent in the English system is 15.432356 grains.

Note should be taken that in the following tables where equivalents are given the United States customary measures are stated, not the Imperial measures of Great Britain, which in the case of the gallon, bushel, etc., differ considerably.

TABLE OF LINEAR MEASURE

A myriameter	= 10,000	meters
A kilometer (km)	= 1,000	"
A hektometer	= 100	"
A dekameter	= 10	"
Meter (m)		
A decimeter (dm)	= 0.1	meter
A centimeter (cm)	= 0.01	"
A millimeter (mm)	= 0.001	"
A micron (μ)	= 0.000001	"

TABLE OF SQUARE MEASURE

A square myriameter	= 100,000,000	square meters
" kilometer (km^2.)	= 1,000,000	"
" hektometer or hektare	= 10,000	"
" dekameter or are (a)	= 100	"
Square meter (m^2)		
A square decimeter (dm^2)	= 0.01	of a square meter
" centimeter (cm^2)	= 0.0001	"
" millimeter (mm^2)	= 0.000001	"

TABLE OF CUBIC MEASURE

A cubic myriameter	= 10^{12}	cubic meters
" kilometer	= 10^9	"
" hektometer	= 1,000,000	"
" dekameter	= 1,000	"
Cubic meter (m^3)		
A cubic decimeter (dm^3)	= 0.001	of a cubic meter
" centimeter (cm^3)	= 0.000001	"
" millimeter (mm^3)	= 0.000000001	"

A cubic meter is also called a *stere*, a unit used in measuring wood.

TABLE OF WEIGHTS

A metric ton (t)	= 1,000,000	grams	= 1,000	kilograms
A quintal (q)	= 100,000	"	= 100	"
A myriagram	= 10,000	"	= 10	"
A kilogram (kg)	= 1,000	"		
A hektogram	= 100	"		
A dekagram	= 10	"		
Gram (g)				
A decigram (dg)	= 0.1	gram		
A centigram (cg)	= 0.01	"		
A milligram (mg)	= 0.001	"		
A mikrogram (γ)	= 0.000001	"		

A metric or international *carat*, used in weighing diamonds, is 200 milligrams, and this international unit was adopted in the United States in 1913.

TABLE OF CAPACITY

A hektoliter (hl)	= 100	liters
A dekaliter (dkl)	= 10	"
Liter (l)		
A deciliter (dl)	= 0.1	liter
A centiliter (cl)	= 0.01	"
A milliliter (ml)	= 0.001	"
A mikroliter (λ)	= 0.000001	"

APPROXIMATE EQUIVALENTS

A meter	= 39.37 inches = 3¼ feet
A kilometer	= ⅝ of a mile
A liter	= 1 United States liquid quart
A kilogram	= 2⅕ pounds avoirdupois
A gram	= 15½ grains
A hectare	= 2½ acres
A square meter	= 10¾ square feet

MORE NEARLY ACCURATE EQUIVALENTS

LENGTH

	Inches	Feet	Yards	Fath's	Miles
Millimeter	0.03937	0.003	0.001		
Centimeter	0.39370	0.033	0.011	0.005	
Decimeter	3.93700	0.328	0.109	0.055	
Meter	39.37000	3.281	1.093	0.547	
Kilometer	39370.00000	3280.833	1093.611	546.817	0.621

CAPACITY

	Cubic in.	Cubic ft.	Dry quarts	U. S. gallons	U. S. bush.
Milliliter	0.06103		0.001		
Centiliter	0.61025		0.009	0.003	
Deciliter	6.10250	0.003	0.091	0.0264	0.003
Liter	61.0250	0.035	0.908	0.26418	0.028
Hektoliter	6102.5000	3.531	90.8102	26.4178	2.83774

MASS

	Grains	Troy oz.	Avoir. lb.
Gram	15.432 36	0.032	0.002
Kilogram	15432.356	32.1501	2.205

SQUARE MEASURE

	Square feet	Sq. yards	Acres
Centare	10.76387	1.196	
Are	1076.38	119.599	0.025
Hektare	107,638.7	11,959.85	2.471

TABLE FOR REDUCING FROM ONE SYSTEM TO THE OTHER

(The figures in heavier type represent either of the two columns beside them, as the case may be, viz., with hektares and acres in the first set of columns, **1** acre = 0.405 hektare, and vice versa **1** hektare = 2.471 acres, and so on.)

Meter		Yard	Kilogr.		Lb. avoir.	Liter		U. S. galls.
0.914	**1**	1.094	0.454	**1**	2.20	3.785	**1**	0.264
1.829	**2**	2.187	0.907	**2**	4.41	7.571	**2**	0.528
2.743	**3**	3.281	1.361	**3**	6.61	11.356	**3**	0.793
3.658	**4**	4.374	1.814	**4**	8.82	15.141	**4**	1.057
4.572	**5**	5.465	2.268	**5**	11.02	18.927	**5**	1.321
5.486	**6**	6.562	2.722	**6**	13.23	22.712	**6**	1.585
6.401	**7**	7.655	3.175	**7**	15.43	26.497	**7**	1.849
7.315	**8**	8.749	3.629	**8**	17.64	30.283	**8**	2.113
8.230	**9**	9.843	4.082	**9**	19.84	34.068	**9**	2.378
9.144	**10**	10.936	4.536	**10**	22.05	37.853	**10**	2.642

Hektare		Acre	Kilometer		Eng. miles	Square Kilometer		Eng. miles
0.405	**1**	2.471	1.609	**1**	0.621	2.590	**1**	0.386
0.809	**2**	4.942	3.219	**2**	1.243	5.180	**2**	0.772
1.214	**3**	7.413	4.828	**3**	1.864	7.770	**3**	1.158
1.619	**4**	9.884	6.437	**4**	2.485	10.360	**4**	1.544
2.023	**5**	12.355	8.047	**5**	3.107	12.949	**5**	1.931
2.428	**6**	14.826	9.656	**6**	3.728	15.539	**6**	2.317
2.833	**7**	17.297	11.265	**7**	4.350	18.129	**7**	2.703
3.238	**8**	19.768	12.875	**8**	4.971	20.719	**8**	3.089
3.642	**9**	22.239	14.484	**9**	5.592	23.309	**9**	3.475
4.047	**10**	24.710	16.093	**10**	6.214	25.899	**10**	3.861

The advantages of the metric system over the English-American system are numerous. Although, in both systems, the standard units of volume, capacity, and weight are directly connected with the standard unit of measure, the relation in the metric system is far more simple. Thus, in the usual system one United States liquid quart has a volume of 57¾ cubic inches, while in the metric system one liter has the volume of one cubic decimeter; in the English system the pound has the weight of about 0.0156 of a cubic foot of water at the standard temperature, while in the metric system one gram has the weight of one cubic centimeter. Although the names used in the metric system are generally longer than the names used in the English-American system, the nomenclature of the former has several advantages. Thus, the prefixes deci, centi, milli, deka, hekto, kilo have in point of derivation a numerical significance and have other applications in the language, while the names inch, foot, yard, rod, and mile are devoid of numerical significance and are distinctive in their use. But the greatest advantage of all results from the use of a uniform scale of relation. In the English-American system seldom do more than two units in succession have the same scale. Thus, in the metric system, 10 centimeters = 1 decimeter, 10 decimeters = 1 meter, . . . , the ratio being always 10; while in the English system, 12 inches = 1 foot, 3 feet = 1 yard, 5½ yards = 1 rod, . . . , the ratio changing between every pair of units. The French Commission of 1790 reported in favor of the decimal scale for reasons of expediency, although admitting that the uniform scale of 12 possessed many advantages.

The metric system was once thought to be superior to all other systems of weights and measures in being founded on an invariable magnitude, one ten-millionth of a terrestrial quadrant. But science dispelled this illusion by showing that this magnitude is not a constant and that the distance originally taken as the basis of the meter was inaccurately measured. The unit distance is now defined as equivalent to the distance between terminal lines on the international prototype meter, a bar of platinum iridium at the International Bureau of Weights and Measures near Sèvres and measured when at the temperature of melting ice (0° C.). Through the researches of Professor A. A. Michelson (q.v.) its length is now known in the terms of the wave length of light, thus making the standard distance replaceable and independent of the prototype standard.

In 1840 the French government conceived the idea of exchanging sets of the metric units for sets of the units of other nations in order to promote an international interest in the metric system. The international expositions at London (1851) and at Paris (1855) were, on account of the immense variety and confusion of metrical units, the first practical demonstrations of the need of a universal decimal system of weights and measures. At the Paris Exposition of 1867 a committee, representing several different nations, was appointed to consider the question of uniformity, and was called the Committee of Weights, Measures, and Moneys. Mathieu was the president of this commission. The committee recommended instruction in the metric system in the public schools and its use in governmental departments and in scientific publications. The Geodetic Association, which met at Berlin in 1867, was also representative of several nations, and likewise favored the general adoption of the metric system. In the year 1869 a committee of the Academy of Sciences at Paris and one of the St. Petersburg Academy recommended the convocation of an international commission, which should consider the means of providing all nations with sets of standard metric units. Such a commission was invited by the French government, and assembled at Paris in 1870. Twenty-four countries responded by sending delegates, Joseph Henry and Julius E. Hilgard representing the United States. This body was divided into committees, the most active one being the French section, during the interval of suspended operations during the Franco-Prussian War. This committee deliberated and consulted for the purpose of devising means for copying the standards preserved in the archives. Some of the questions which concerned the committee were the composition of the metal to be used in constructing the new unit of length, the most desirable form of cross section, ways of expressing the length, as the distance between the ends, or between two fine lines made on the bar, means of comparing the new unit with the standard of the Archives, means for determining its variation due to changes in temperature, and other considerations. The International Committee reassembled in 1872 and it was duly proposed that an international bureau of weights and measures be located at Paris, the definite conception of the International Bureau being later decided upon at the diplomatic conference of 1875. At the second meeting of the International Commission in 1872 it was decided to make the standard meter and the standard kilogram of the Archives the actual bases for the new standards. In order to give the work of the commission the character of an international act, its members so far being simply citizens of their respective countries, the French government invited plenipotentiaries and delegates from all the nations interested. Representatives

from 20 states assembled at Paris (1875) to constitute the Diplomatic Conference of the Meter. E. B. Washburne acted as plenipotentiary and H. Vignaud as delegate for the United States. The Observatory of the International Bureau, decided upon by this conference, was completed in 1878. It stands at the entrance of the park of St. Cloud, near Sèvres, on a reservation presented by the French government. The management of the Bureau reposes in the International Committee under the authority of the General Conference. In the Observatory are kept the instruments used in the determination of the international standards, the chief of which are the comparators, balances, and thermometers. The extent of the demands upon this Bureau may be inferred from the fact that, by 1913, 25 different countries had formally sanctioned the national prototype standards received from the International Bureau and known in terms of the international prototype. The meters are highly polished metal bars made of an alloy of platinum and iridium, and the kilograms are cylinders of the same material.

Bibliography. For an outline history of the metric system, with its present status, its equivalents, and particularly for a full bibliography bearing on its development, consult Hallock and Wade, *Evolution of Weights and Measures and the Metric System* (New York, 1906); a complete history in which the founding of the International Bureau of Weights and Measures is discussed is Bigourdan, *Le système métrique des poids et mesures* (Paris, 1901); an excellent work in small compass is Ch. Ed. Guillaume, *Unités et Etalons* (ib., 1893); as is also his *La Convention du mètre et le Bureau International des Poids et Mesures* (ib., 1902); id., *Les récents progrès du Système Metrique*, various reports, notably those of 1907 and 1913 (ib., 1907–13); also Fonvielle, *Le mètre international définitif* (Paris, 1875); Barnard, *Metric System* (3d ed., Boston, 1879); Potts, *Elementary Arithmetic* (London, 1886); Bassot, *School of Mines Quarterly* (New York, 1901), and various publications of the International Bureau of Weights and Measures and the United States Bureau of Standards (Washington), particularly for equivalents *Circular No. 47* (Washington, 1914). In opposition to the introduction of the Metric System into the United States and Great Britain much has been written, among which might be mentioned Halsey and Dale, *The Metric Fallacy* (New York, 1903), and various papers in the *Transactions* of the American Society of Mechanical Engineers (ib., annually). See WEIGHTS AND MEASURES.

MET'RONOME (from Gk. *μέτρον, metron*, measure + *νόμος, nomos*, law). A small machine for indicating the correct time or speed at which a musical composition should be played. It was invented in 1816, and consists of a pendulum, actuated by clockwork, which swings in front of a graduated scale. To the upper part of the pendulum-rod is attached a movable weight which can be set at any figure indicated by the scale. The figure 60 means that when the weight is set there the pendulum swings 60 times a minute. Thus it beats exact seconds. When set at 120 it beats half seconds. The metronome indication appears always at the beginning of a composition. M. M. (Mälzel's metronome, from its reputed inventor, Mälzel) 𝅗𝅥 = 80 means that the tempo must be taken so that 80 half notes fill the space of one minute. The indications differ with the tempo and time of each composition. A work written as allegro in common time might be indicated: M. M. ♩ = 100; allegro in alla breve: M. M. 𝅗𝅥 = 100; adagio in $\frac{6}{8}$: M. M. ♪ = 66; scherzo (Presto $\frac{3}{4}$): M. M. 𝅗𝅥. = 120. By means of the metronome the composer is enabled to give the minutest directions in respect to the tempo, for the old terms allegro, andante, presto, etc., can only serve as *approximate* indications, leaving much to the temperament of the individual performer. The metronome is of the greatest value and is much used to-day in training beginners to play strictly in time.

METROP'OLIS. A city and the county seat of Massac Co., Ill., 38 miles by river east by north of Cairo, on the Ohio River and on the Illinois Central and the Chicago, Burlington, and Quincy railroads (Map: Illinois, G 11). It is built on a high bluff which slopes gradually towards the river. A fine railroad bridge has been erected recently at this point. There are three city parks, a Carnegie library, hospital, the beautiful Fort Massac State Park, sanatorium, and fine Odd Fellows' Temple, courthouse, music hall, and city hall buildings. There are potteries, saw and planing mills, flour mills, veneer, box, stave, heading, spoke, automobile parts, and basket factories, a fluorspar separating and refining plant, tie-treating plant, bottling works, and large lumber interests. There are extensive deposits of potters' clay in the vicinity. The government is administered by a mayor, elected every two years, and a unicameral council. The city owns and operates the water works and electric-light plant. Metropolis is built on the site of old Fort Massac, which was settled about 1700 by French and Indians, but was not permanently inhabited until 1838; five years later it was incorporated. Pop., 1900, 4069; 1910, 4655.

MET'ROPOL'ITAN (Lat. *metropolitanus*, MGk. *μητροπολίτες, mētropolites*, from *μητρόπολις, mētropolis*, a capital city, from *μήτηρ, mētēr*, mother + *πόλις, polis*, city). An ecclesiastical title, in modern times practically equivalent to archbishop (q.v.). It arose from the early custom of giving precedence to the bishop of the chief city or metropolis of a province. In some of the English colonies where the title of archbishop is not used by the Anglican church, that of metropolitan is applied to the chief bishop of a province. For the prerogatives of metropolitans in canon law, consult Owen, *Institutes of Canon Law* (London, 1884).

METROPOLITAN MUSEUM OF ART. The principal art museum of New York and the largest and most important in the United States. At a public meeting held Nov. 23, 1869, a committee of 50 was appointed to organize the project and raise an endowment of $250,000. On Jan. 31, 1870, the first trustees and officers were elected with John Taylor Johnson as president. A charter was secured on April 13 of the same year. On April 5, 1871, a legislature, dominated by William H. Tweed, appropriated $500,000 for a building in Central Park and defined the relation of the museum to the city. The earliest home of the museum (1871–73) was the Dodworth building, 681 Fifth Avenue, then the Douglas mansion, until the completion of the building in Central Park in 1879. The central portion of the Fifth Avenue front, after the designs of Richard Morris Hunt, was completed in 1902 at the cost of $1,200,000 to the city. In

1904 a further appropriation of $1,250,000 was made for the north part of the Fifth Avenue front, after the designs of McKim, Mead, and White. Further extensions were made under the law of 1907, authorizing the expenditure of $750,000 a year for ten years. The new buildings are of classical design in light gray stone, and their total cost when completed is estimated at $20,000,000. The museum is governed by a board of trustees, selected from certain of its fellows. The corporation is composed of fellows and members of various degrees, according to the amount of their yearly contribution, the total membership for 1914 being 3169. It is administered by a regular staff, composed of a director, secretary, treasurer, curators of the different departments and their assistants, and the librarian with staff. The cost of its administration in 1914 was $461,555.39, to which the city contributed its yearly quota of $200,000. The long administration of General di Cesnola (q.v.), as director (1879–1904), was conservative in character; but with the presidency of J. Pierpont Morgan (q.v.) (1904–13), a broad policy of expansion and popularization of the museum's activities began.

The art treasures of the museum, which are classified in different departments, form, with the loans exhibited, a collection of the first rank. The department of paintings is especially rich in Flemish, Dutch, Old English, French, and American masters. Its nucleus, a collection, chiefly of Dutch and Flemish masters, was acquired in 1871 for $116,180.27. It was enriched by the Catherine Lorillard Wolfe Collection bequest of modern European paintings, with an endowment of $200,000 for further purchases; the small but exceedingly valuable collections of old masters donated by Henry G. Marquand, second president of the museum; the Vanderbilt loan of 135 paintings of the last half of the nineteenth century, chiefly French (Barbizon) masters, made in 1902 but indefinitely renewed; the Hearn collection (1905), rich in American pictures, with funds aggregating $250,000 for further purchases of American paintings; the Altman collection (see below); and the pictures bequeathed in 1915 by Mrs. Morris K. Jesup, with $50,000 for maintenance and $150,000 for the encouragement of American painting.

The most important feature of the department of classical art is the Cesnola collection of Cypriote antiquities, the largest and most important of its kind in the world, purchased in 1874 for the nominal sum of $60,000. Among the other treasures of this department is an Etruscan bronze chariot of the sixth century B.C.; many Greek and Roman marbles and bronzes, including a remarkable statue of an Imperial prince of the Julio-Claudian family, a Greek work of the first century A.D., purchased in 1915; excellent collections of Greek terra cottas, vases, and ancient glass; and a splendid collection of Rodin's sculptures, donated chiefly by Thomas F. Ryan. The department includes also an important representative collection of Chinese paintings. The department of Egyptian antiquities, organized in 1906, has conducted many excavations at Lisht, Kharga, and Thebes, the results of which form a representative collection, especially rich in the art of the Middle Kingdom. The department of decorative arts, founded in 1910, is housed in a wing built especially for the purpose, in rooms chronologically arranged, with the remarkable Hoentschel collection, donated and in part loaned by J. P. Morgan as its nucleus. It includes fine examples of sculpture, particularly of the French Gothic and the Italian Renaissance periods. The department of arms and armor was made one of the most important in the world by the acquisition of the William H. Riggs collection of mediæval armor in 1914. The library, which occupies a wing especially built for this purpose, is one of the best art libraries in the United States, and contains 30,000 volumes and nearly 40,000 photographs and other reproductions, including 600 Japanese prints.

Besides the above, the museum has received other important legacies; including the John Crosby Brown collection of musical instruments in 1899; the Jacob H. Rogers bequest of about $7,000,000 in 1901, for the purchase of art objects and books; the Heber Bishop collection of jade in 1902; an unconditional bequest of $1,000,000 by Francis L. Leland in 1912; the Benjamin J. Altman (q.v.) collection, small, exceedingly good in quality, and especially rich in Dutch paintings, Italian sculpture, and Chinese porcelains. The museum also possesses an important collection of plaster casts of architectural and sculptural subjects. The museum organizes temporary exhibitions of importance, such as the Hudson-Fulton Memorial Exhibition of Dutch painting and early American art in 1909. It coöperates with the universities and public schools, offers lectures, and seeks in every way to promote the diffusion of art. After Mr. Morgan's death, Robert W. De Forest (q.v.) was elected president. The directors since General di Cesnola have been Sir Caspar Purdon Clarke (1905–10) and Edward Robinson (1910–) (qq.v.). Consult: W. E. Howe, *A History of the Metropolitan Museum* (New York, 1913); the monthly *Bulletin;* and the various catalogues and handbooks of the different departments and collections published by the museum.

METRORRHAGIA. See MENSTRUATION.

METSU, mĕt'sụ, or **METZU,** GABRIEL (c.1630–67). A leading Dutch genre painter. He was born in Leyden in 1630, or possibly 1629, and is thought to have been a pupil of Gerard Dou. In 1648 he had acquired sufficient reputation to become one of the first members of the Painters' Guild of his native place, and between 1654 and 1657 he removed to Amsterdam, where he died in October, 1667. He painted scenes from the life of the burgher classes, although occasionally, in his market scenes and kitchen maids, he deals with humbler life. He also occasionally treated mythological and religious subjects, but with less success. In refinement of drawing and grace of expression he ranks among the best of the Dutch school. His pictures are characterized by smooth and polished technique, delicate treatment, and picturesque composition; they rarely contain more than three figures and have none of the boisterous action of Jan Steen; but the heads are animated and express cheerfulness and good humor; the color is clear and harmonious, with a tendency to coolness in his later work. Though often reminding us of one or another of his great contemporaries, Metsu's style always remained distinctly individual. His principal paintings include: "The Lady at the Harpsichord," in the Petit Palais, Paris; "The Music Lesson" and "Amsterdam Market," in the Louvre; "Music Lovers" and "The Mother with the Sick Child," in the Stiengracht collection at The Hague; "The Duet," in the National Gallery,

London; "The Sleeping Sportsman," in the Wallace collection, London; "The Music Lesson" (1659) and "A Visit to the Nursery," both in the Metropolitan Museum, New York; "Feast of the King of Beans," in which there is a touch of Jan Steen's humor, in the Pinakothek at Munich; "Old Poultry Peddler" (1662) and the "Young Woman Selling Poultry," both in the Dresden Gallery; "The Hay Barn," in the Johnson collection, Philadelphia. Consult: *Masters in Art*, vol. vii (Boston, 1906), containing an exhaustive bibliography; Hofstede de Groot, *Catalogue of Dutch Painters*, vol. i (London, 1908); Wilhelm Bode, *Great Masters of Dutch and Flemish Painting* (ib., 1909).

METSYS, QUINTEN. See MATSYS, QUINTEN.

METTERNICH, mĕt'tĕr-nĭk, CLEMENS WENZEL NEPOMUK LOTHAR, PRINCE (1773–1859). An Austrian statesman. He was born at Coblenz, May 15, 1773, being the son of Franz Georg Karl, Count von Metternich, an Austrian diplomat and an associate of Kaunitz. Young Metternich was educated at the University of Strassburg, and afterward studied law at Mainz and traveled in England. In 1795 he married the granddaughter of Kaunitz, by whom he acquired large estates. His diplomatic career commenced at the Congress of Rastadt (1797–99), which he attended as representative of the Westphalian lordly houses. In 1801 he became Austrian Ambassador at Dresden, and two years later was appointed Ambassador to the Prussian court, where he negotiated the treaty of alliance between Austria, Prussia, and Russia against France in 1805. In 1806 he went as Ambassador to Paris. In 1809 he succeeded Count Stadion as Minister of Foreign Affairs, concluded the Treaty of Schönbrunn with France, and was instrumental in bringing about the marriage of the Archduchess Maria Louisa to Napoleon. He guided the course of Austria amid the difficulties of 1812–13. He maintained at first a temporizing policy and a scheme of armed mediation by Austria; but the arrogance of Napoleon's demands and the personal humiliations to which he was subjected at his famous interview with the French Emperor in Dresden in June, 1813, led him to resolve upon the declaration of war by Austria against France, and he subsequently conducted with great ability the negotiations which ended in the completion of the Quadruple Alliance. He was afterward employed in almost all the chief diplomatic affairs of that eventful time. With little concern for the cause of German nationality, which animated so largely the Prussians during the War of Liberation, Metternich during the last two years of Napoleon's power pursued a policy aiming at the advancement solely of Austrian interests. Fearing lest the defeat of France should raise up powerful rivals for Austria in Russia and Prussia, he exerted himself to preserve for France its ancient boundaries, pursuing that end ostensibly in order to preserve the balance of power in Europe. With masterly diplomacy he succeeded in imposing his policy on the allies, represented Austria in the Congress of Châtillon in February and March, 1814, and participated in the deliberations leading to the Treaty of Paris. In June he visited England and formed a new Quadruple Alliance for the preservation of the peace of Europe. As presiding officer of the Congress of Vienna he exercised a preponderating influence on the deliberations of that body, and succeeded in gaining for Austria a dominant position among the Powers of Europe, with her interests supreme in Germany and Italy. After the Congress of Vienna he became the leading statesman of Europe, and the period 1815–48 is sometimes called the "Age of Metternich." He was the inspiring genius of the reactionary policy of the Restoration period. Crafty and cynical, having no sympathy with the aspirations of the people, his schemes were all directed to restoring the old order as far as possible. In 1821 he was made Austrian Chancellor. With his customary astuteness he made use of the Holy Alliance (q.v.), organized by Alexander of Russia to further the cause of Christian peace, as an instrument for the repression of all liberal or national movements. Under his inspiration congresses were held at Karlsbad (1819), Troppau (1820), Laibach (1821), and Verona (1822), at which action was taken against the Burschenschaft and the freedom of the press in Germany, the national movement in Italy, and the struggle for constitutionalism in Spain. He consistently opposed the Greek movement for independence, but there Russia refused to follow him. With time his influence over the French and Russian courts disappeared, but in Germany and Italy the reactionary policy of Metternich remained unabated until 1848. The revolutionary movement of that year, however, breaking forth with sudden violence, ended Metternich's system and caused the aged minister to flee from Austria (March, 1848) and to seek refuge in England and Belgium; nor did he return to Vienna till the end of 1851, when he received great marks of honor and favor from the Emperor; but, although sometimes consulted, he was never again asked to undertake the cares of office. He died at Vienna, June 11, 1859. His writings, under the title *Aus Metternichs nachgelassenen Papieren*, were published by his son, Prince Richard (8 vols., Vienna, 1880–84; in English translation under the title of *Memoirs*).

Bibliography. Albert Sorel, in *L'Europe et la révolution française*, gives a good sketch of Metternich and his political system. Consult also: writings by Friedrich von Gentz (q.v.); Gross-Hoffinger, *Fürst Metternich und das österreichische Staatssystem* (Leipzig, 1846); Beer, "Fürst Clemens Metternich," in *Der Neue Plutarch*, vol. v (ib., 1877); Wilhelm Oncken, *Oesterreich und Preussen im Befreiungskriege* (2 vols., Berlin, 1876–79); A. Prokesch-Osten, *Aus dem Nachlass van Prokesch-Osten* (Vienna, 1881); Malleson, *Life of Prince Metternich* (New York, 1888); Mazade, *Un chancelier d'ancien régime: le règne diplomatique de M. de Metternich* (Paris, 1889); Demelitsch, *Metternich und seine auswärtige Politik* (Stuttgart, 1898); *Cambridge Modern History*, vol. xi (New York, 1909); G. A. C. Sandeman, *Metternich, Life and Career* (ib., 1911); Oscar Browning, *History of the Modern World*, vol. i (London, 1912). See AUSTRIA-HUNGARY; VIENNA, CONGRESS OF; CARLSBAD DECREES.

METTEYA. See MAITREYA.

METTRAY, mĕ'trâ'. A great agricultural and industrial colony (reformatory) at Mettray, near Tours, France, which has for years been looked upon as the model of all such institutions. It was founded in 1839 by Mettray Demetz and Bretignières de Courteilles, who had gotten their inspiration from America. The object was to keep young boys out of the regular prisons and to teach them, in addition to common school branches, trades and agriculture. Boys of the

better classes who are sent by their parents to the school are kept separately in the "maison paternelle" and spend their time in study. In 1899 the colony contained 450 boys. After the boys leave the institution a supervision is maintained over them. See *Bulletin de la commission pénitentiaire internationale* (Brussels and Bern, 1900).

METZ, mĕts. A town and first-class fortress in Alsace-Lorraine, Germany, capital of the District of Lorraine, situated at the confluence of the Seille with the Moselle, about 11 miles east of the French frontier and 66 miles by rail south-southwest of Treves (Map: Germany, B 4). It is built partly between the two rivers and partly on islands of the Moselle. The streets bear both German and French names. The older section is irregularly constructed and is ancient in appearance. In the southwestern portion of the town is a splendid esplanade with statues of Marshal Ney, Prince Frederick Charles, Emperor William I, and Emperor Frederick (1909), and a fine fountain. The magnificent Gothic cathedral, the finest structure in the town, was begun in the thirteenth century. It was consecrated in 1546 and is now being restored. It has numerous fine specimens of stained glass and is surmounted by a tower 387 feet high. The church of St. Vincent, a fine Gothic structure of the thirteenth century, the garrison church, and the church of St. Constance, with frescoes, are also of architectural interest. Among the secular buildings may be mentioned the palace of justice, the town hall, the theatre, the barracks, and the Central Railway Station, completed in 1908.

The educational institutions include a Gymnasium, a Realschule, a seminary for priests and for teachers, schools of art and music, and a military school. The municipal library of 100,950 volumes in 1913 is rich in works relating to the history of Metz, and the municipal museum contains collections of coins and paintings and of antiquities found in the vicinity. Metz has lost somewhat in industrial importance since its occupation by the Germans, the French having withdrawn a large amount of capital. The chief manufactured products are leather and leather goods, arms, hats, artificial flowers, coarse cloth, preserves, etc. The trade is chiefly in the agricultural products of the surrounding country.

The city is regarded as one of the best-fortified places in Europe. Its fortifications, extending along the Moselle and the Seille, consist of works begun by the French and completed by the Germans, and of works built entirely by the conquerors. Some portions of the old fortifications have also been retained. Pop., 1890, 60,186; 1900, 58,424, part of the troops having been withdrawn; 1910, 68,598, including the garrison of nearly 25,000 men. The civil population is almost entirely Roman Catholic.

Metz was known to the Gauls as Divodurum and in mediæval times as Metac. By the Treaty of Mersen (870) the city fell to East Francia (later Germany) and rapidly attained importance, so that in the thirteenth century it became a free Imperial city. It was here that Charles IV in 1356 proclaimed the Golden Bull. Metz became involved in many conflicts with Lorraine, and in the period of the Reformation the city was a centre of disturbance. In 1552 it was handed over to Henry II of France, together with Toul and Verdun, by the Protestant lords in order to gain French aid against Charles V. (See MAURICE OF SAXONY.) The latter besieged the city in vain, and the Peace of Westphalia (1648) confirmed France in possession of the city. Metz was henceforth chiefly important as a strong fortress, and played a prominent rôle in the campaigns of 1814 and 1815 against Napoleon and again in the Franco-German War. As a result of the battles of Colombey-Nouilly, Mars-la-Tour, and Gravelotte (see FRANCO-GERMAN WAR), the German army occupied the city on Oct. 29, 1870, and the Peace of Frankfort gave Metz to Germany. In the European War which broke out in 1914 the German communications with Metz were the objective of several French offensive movements. It was also attacked by the allied aërial fleets. See WAR IN EUROPE. Consult: F. D. H. Klipffel, *Metz, cité épiscopale et impériale* (Brussels, 1867); G. T. Robinson, *The Fall of Metz* (London, 1871); Westphale, *Geschichte der Stadt Metz* (3 vols., Metz, 1875–78); F. Du Val des Bois, *Au pays de Metz* (Paris, 1886); Gustave Marchel, *La France moderne, le drame de Metz* (ib., 1890); E. F. Biskamp, *Das mainzer Domkapitel bis zum Ausgang des 13. Jahrhunderts* (Marburg, 1909).

METZINGER, LÉON (1842–1914). A French general, born at Dijon. He graduated from the military school of St. Cyr in 1863. From 1898 to 1903 he was commander of the Fifteenth Army Corps and then until his retirement in 1907 he served as general of division and member of the Superior Council of War. He received the grand cross of the Legion of Honor. During his 50 years of service he took part in 15 campaigns and was at the sieges of Hué and Tananarive. To *L'Echo de Paris* he contributed a number of articles on the reorganization of the army.

MET'ZU. See METSU.

MEUDON, mē'dôn'. A town in the Department of Seine-et-Oise, France, in the southwestern outskirts of Paris (Map: France, N., A 2). Its château, fitted up by Napoleon for Maria Louisa in 1812, was almost destroyed during the bombardment by the Germans in 1871; it has been partly restored. The church contains a statue of Rabelais, who was curé of Meudon. It has an observatory, a splendid orphan asylum, founded by the Duchess Galliera, and a school of military aviation. The forest near by is a favorite holiday resort. Meudon's manufactures comprise glass, chalk, linen, whiting, buttons, and ammunition. Rodin the sculptor located his studio here, and here was finished some of his most famous work. Pop. (commune), 1901, 9702; 1911, 12,292.

MEULEN, mē'len, ADAM FRANS VAN DER (1632–90). A Flemish battle painter, born at Brussels. He was a pupil of Peter Snayers, but afterward went to France on the invitation of Lebrun and was made Louis XIV's court painter (1666). During the war in Flanders he accompanied the King and painted pictures of the battles and sieges in which he was engaged. These are remarkable for the care bestowed upon historical detail and the numerous portraits of contemporaries contained in them. There are a number of them in the Louvre and at Versailles and two in the Metropolitan Museum, New York. He also designed cartoons for the Gobelins.

MEUMANN, moi'män, ERNST (1862–1915). A German psychologist and educator. He was privat docent in philosophy at Leipzig (1894), associate professor (1897) and professor of

psychology and pedagogy at Zurich (1900), professor of philosophy at Königsberg (1905), at Münster (1907), at Halle (1909), at Leipzig (1910), and professor of philosophy and pedagogy at the Kolonialinstitut in Hamburg (1911). He was early known for his investigations in psychology, especially in the fields of rhythm and the perception of time; but his greatest reputation is as the founder and systematizer of modern experimental pedagogy. He became editor of the *Zeitschrift für experimentelle Pädagogik*, of *Pädagogische Monographien*, and of *Die Psychologie in Einzeldarstellungen* and coeditor of the *Archiv für die gesamte Psychologie*. Besides numerous articles he wrote: *Die Oekonomie und Technik des Lernens* (1903; 3d ed., 1912; Eng. trans., *The Psychology of Learning*, 1913); *Vorlesungen zur Einführung in die experimentelle Pädagogik* (2 vols., 1907; vol. iii, 1914); *Intelligenz und Wille* (1908; 2d ed., 1913); *Einführung in die Aesthetik der Gegenwart* (1908); *System der Aesthetik* (1914); *Abriss der experimentellen Pädagogik* (1914).

MEUNG, mēn, Jean de (c.1250–?). A French poet, also called Jean Clopinel. He was born at Meung-sur-Loire and died at the beginning of the fourteenth century. Not much is known about his early life, but it is assumed that he studied at the University of Paris. His literary fame rests chiefly on his addition to the *Roman de la rose* (q.v.) of Guillaume de Lorris (q.v.). The poem, as Guillaume de Lorris left it, comprised about 4000 verses. Jean de Meung added about 18,000, of which 12,000 can be found in the authors of whom he was especially fond—notably 2000 from Ovid alone. Ostensibly continuing the allegory of his predecessor, who intended to make it a poem of chivalry, Jean de Meung in reality introduced quite a different spirit and made the allegory a mere cloak for telling stories and indulging in political and moral satire. At the request of King Philippe he translated the *Consolatio* of Boëthius into prose and verse. Towards the end of his life he wrote his *Testament*, in which, although praising sincere piety, he pours bitter sarcasm on monks. Consult: Paris, "Jean de Meung," in the *Histoire littéraire de la France*, vol. xxviii (Paris, 1840); Quicherat, "Jean de Meung et sa maison à Paris," in the *Bibliothèque de l'Ecole des Chartres* (ib., 1880); Langlois, *Origines et sources du Roman de la rose* (ib., 1890).

MEUNIER, mē'nyā', Constantin (1831–1905). The foremost among modern Belgian sculptors; also a painter of note. He was born April 12, 1831, at Etterbeek, near Brussels, studied sculpture at the Brussels Academy and later under Fraikin, and then took up painting under Navez. He first devoted himself to religious and historical subjects, such as "The Burial of a Trappist" (Courtrai Museum), "The Stoning of St. Stephen" (Ghent Museum), and "The Peasants' War" (1875, Modern Gallery, Brussels), which he rendered with almost brutal realism. From these he turned to the study of the workers in the mining and industrial regions of Belgium, the first fruits of which were "The Broken Crucible" (1880) and "The Descent of the Miners." Thereafter his life was dedicated to what others have called the "æsthetics of work," interrupted only by a trip to Spain in 1882–83 and by his duties as professor of painting at the Louvain Academy (1886–94). It was above all the monumental plastic qualities of the laborer which appealed to him; therefore it came about that when past 50 he turned again to sculpture and attained in this medium his greatest results. His works have been termed "hymns to labor." They are full of lyric power and vigorous rhythmic movement; the execution is sincere and forceful, though often neglectful of detail. Meunier depicts the struggle of man with the earth, the tragedy rather more than the grandeur and beauty of labor; his art is deep and intensely human. The first of his great typical figures of laborers were "The Hammerman" (1884) and "Puddler Resting" (1885). Other celebrated ones are "The Dock Hand" (Luxembourg), "The Sower" (Botanical Garden, Brussels), and "The Mine Girl." The statuette "Old Mine Horse," the group "Mine Damp" (Brussels Gallery), the equestrian group "At the Watering Place" (Square Ambiorix, Brussels), the relief "Puddlers" (Luxembourg), and the monument to Father Damien, at Louvain, are also fine examples of his work. On the death of his two sons he had returned for a time to religious subjects, producing the "Prodigal Son" (1895, Berlin Gallery), "Ecce Homo," and "Pietà." His crowning achievement, however, is the splendid unfinished "Monument to Labor," purchased by the state for the Brussels Gallery. Four reliefs, entitled "Industry," "The Harvest," "The Port," and "The Mine," are inserted in the sides; the whole is surmounted by the figure "The Sower"; and other figures are about the base. Exhibitions of Meunier's works have been frequently held throughout Europe, and in 1913–14 in America. Meunier died April 4, 1905, at Brussels, where he had lived since leaving Louvain in 1894. Consult: Camille Lemonnier, *Constantin Meunier, sculpteur et peintre* (Paris, 1904); Walther Gensel, *Constantin Meunier* (Bielefeld, 1905); Christian Brinton, *Catalogue* of the American exhibition (New York, 1914); W. O. Partridge, "Meunier the Belgian Sculptor," in *Homiletic Review*, vol. lxviii (ib., 1914).

MEUNIER, (Etienne) Stanislas (1843–). A French geologist, born in Paris and educated there in the Faculty of Sciences. He became a doctor of science in 1869, was made laureate of the Academy of Sciences in 1878, and in 1892 was appointed professor of geology at the National Museum of Natural History. He was created a Knight of the Legion of Honor and served as vice president of the Geological Society of France. His writings include: *Etude descriptive sur les météorites* (1867); *Lithologie terrestre et comparée* (1870); *Le ciel géologique* (1871); *Géologie des environs de Paris* (1875; new rev. ed., 1912); *Les causes actuelles en géologie* (1879); *Excursions géologiques à travers la France* (1882); *Météorites* (1884); *Géologie régionale de France* (1889); *La géologie comparée* (1895); *Nos terrains: géologie populaire* (1898); *La géologie générale* (1903); *La géologie expérimentale* (1904); *Catalogue de la collection de géologie expérimentale du muséum* (1907); *Les convulsions de l'écorce terrestre* (1910).

MEURICE, mē'rēs', François Paul (1820–1905). A French dramatist, born in Paris and educated at the Collège Charlemagne. In 1842 he prepared a version of *Falstaff* for the Odéon with Vacquerie, presented at the same theatre in 1843. With the same collaborator he produced *Le capitaine Paroles* and an imitation of *Antigone* (1844), and he assisted Dumas in a

metrical translation of *Hamlet*, which was given at the Théâtre Historique in 1847. The following year he became chief editor of Victor Hugo's *L'Evénement*, to whose cause Meurice was so devoted that he suffered nine months' imprisonment (1851), but in 1869 he aided in starting a new journal with the same motive, *Le Rappel*, and he was intrusted by Hugo himself with the publication of his complete works (46 vols., 1880–85). Meurice dramatized several of them, as well as a number of George Sand's novels, and his other plays include: *Benvenuto Cellini* (1852; new ed., 1891); *Schamyl* (1854); *L'Avocat des pauvres* (1856); *Fanfan la tulipe* (1858); *La vie nouvelle* (1867); *Cadio* (1868); an adaptation of the *Midsummer Night's Dream* (1886); *Struensée* (1898), crowned by the Academy. Meurice also wrote romances, such as *La famille Aubry* (1854), *Césara* (1869), and *Le songe de l'amour* (1869).

MEURSIUS, mēr'sī-ŭs (VAN MEURS), JOHANNES (1579–1639). A Dutch classical scholar and historian, born at Loosduinen, near The Hague. At the age of 16 he finished a commentary on the *Cassandra* of Lycophron. He traveled much and in 1610 was appointed professor of Greek and history at Leyden. Later the political disturbances in his country and the execution of Jan Barneveldt, to whose sons he had once been tutor, exposed him to considerable persecution and cost him the high favor which he had once enjoyed. Hence he left Holland and in 1625 accepted a position at the Academy of Sorö in Denmark, where he spent the remainder of his life. His published works include many editions of Greek authors, Lycophron, Apollonius Dyscolos, Philostratus, Procopius, and others. His numerous treatises on Greek literature are mostly reprinted in J. F. Gronovius' *Thesaurus Antiquitatum Græcarum*. His *Glossarium Græco-Barbarum* (1614) and *Athenæ Batavæ* (1625) also deserve mention. His complete works were edited in 12 volumes by Lami (Florence, 1741–63). Consult Van der Aa, *Biographisch Woordenboek der Nederlanden* (Amsterdam, 1869), and J. E. Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

MEURTHE-ET-MOSELLE, mērt'-ā-mō'zĕl'. A frontier department in the northeast of France, part of the old Province of Lorraine, and composed of the remnants of the departments of Meurthe and Moselle which remained to France after the Treaty of Frankfort, 1871 (Map: France, N., M 4). Area, 2039 square miles. Pop., 1911, 564,730. It is named from the principal rivers which traverse the department. The surface is diversified and picturesque, the east border being marked by the wooded Vosges Mountains, which attain a maximum altitude of 2041 feet. Iron, copper, lead, rock salt, gypsum, and building stone are the chief mineral products; and the fertile soil yields abundant crops of cereals, hops, tobacco, beetroot, and a variety of fruits. There are manufactures of steel, iron, railway materials, hats, soap, matches, textiles, pottery, glass, paper, chemicals, wine, and beer. Capital, Nancy. Chief towns, Lunéville, Toul, and Longwy. The Department of Meurthe-et-Moselle was the scene of almost continuous fighting during the European War which began in 1914. See WAR IN EUROPE.

MEUSE, mēz. A frontier department in the northeast of France, part of the ancient Province of Lorraine, bordered on the north by Belgium (Map: France, N., L 4). Area, 2409 square miles. Pop., 1911, 277,955. It is traversed from southeast to northwest by the valley of the Meuse, flanked by the wooded Argonne hills and the Côtes de Meuse, also the rivers Orne and Chiers. The entire department is a highland, well forested, with fertile valleys producing wheat, oats, rye, barley, potatoes, and hemp; grapes are grown for wine, and the beetroot for sugar. It has minor manufactures of iron and steel instruments, textiles, lumber, leather, glass, and paper. Meuse was the scene of heavy fighting during the European War, which began in 1914 (see WAR IN EUROPE). Capital, Bar-le-Duc.

MEUSE, mēz, or **MAAS**, mäs. One of the principal rivers of western Europe. It rises on the Plateau of Langres in the Department of Haute-Marne, northeast France, and flows at first north through a narrow, winding valley with high and steep sides, sometimes becoming cañon-like with rocky cliffs, and through the wild forest region of Ardennes (Map: France, N., L 4). It then flows northeast through Belgium into Holland, the land becoming gradually lower, changing through the heath lands of north Belgium to the extensive peat bogs known as De Peel in southeast Holland. Finally the river turns westward, joins the Waal, one of the arms of the Rhine, opposite Gurkum, and empties into the North Sea through the great delta common to the two rivers, a large, compound estuary consisting of broad, sandy, and shallow channels inclosing a number of low, flat islands. The united Meuse and Waal first divide into two arms, one of which, the Hollandsch Diep, flows southwest and, after communicating southward with the delta of the Scheldt (q.v.), enters the sea through the broad Haringvliet. The other arm flows west and again divides into the Old and the New Meuse, which, uniting at several points, flow parallel to the sea. The Old Meuse communicates by side channels with the Haringvliet, and the New Meuse receives the Lek, an arm of the Rhine. The New Meuse, which passes Rotterdam, is the main channel for navigation. The total length of the Meuse is 498 miles and it is navigable for 355 miles. Its upper reaches are connected by canal with the Saône, forming the Canal de l'Est, which gives France a waterway north and south along the east frontier. Its principal tributaries are the Sambre from the left and the Semoy, Ourthe, and Roer from the right. It connects with extensive canal systems in Belgium and in Holland. Above Neufchâteau, in the Department of Vosges, the river loses itself underground for some miles. The chief cities on its banks are Verdun (the head of navigation), Sedan, and Charleville in France; Namur and Liége in Belgium; and Maastricht, Dordrecht, and Rotterdam in Holland. The line of this valley was followed by part of the German army, the Army of the Meuse, in its invasion of Belgium and France in 1914. This valley is not only the shortest route from Berlin to Paris, but also the easiest as far as natural conditions are concerned. The region between the Meuse and the Moselle was almost completely devastated during the struggle between the Germans and the allies in 1914. See WAR IN EUROPE. Consult W. M. Davis, "The Seine, the Meuse, and the Moselle," in *Geographical Essays* (Boston, 1909).

MEW, or SEA MEW. In Great Britain, a gull (q.v.).

MEWAR. See UDAIPUR.

MEWS, PETER (1619–1706). An English bishop and royalist. He was born near Sherborne, Dorsetshire, and was educated at the Merchant Taylors' School and at St. John's College, Oxford. When the Civil War broke out he joined the King's forces in 1642; was promoted to captain; was captured at Naseby; and upon his release retired to Holland in 1648. During the Protectorate he undertook two different missions to Scotland in behalf of the royalists. After the Restoration he resumed his fellowship at Oxford; became chaplain to the King; and was president of St. John's College, Oxford, in 1667–73, and vice chancellor of the university in 1669–73. He was appointed Bishop of Bath and Wells in 1672, and was elected Bishop of Winchester in 1684. He upheld the opposition of the fellows of Magdalen College to James II in 1688, and in 1689 swore allegiance to William and Mary.

MEXBOROUGH, měks'bŭr-ō. A town and urban district in the West Riding of Yorkshire, England, on the Don, 5 miles northeast of Rotherham. It has large iron, glass, and pottery industries. The markets are municipal property. Pop., 1901, 10,430; 1911, 14,401.

MEXCALA, mĕs-kä'lä. A river of Mexico. See MESCALA.

MEXIA. A city in Limestone Co., Texas, 40 miles northeast of Waco, on the Houston and Texas Central and the Trinity and Brazos Valley railroads (Map: Texas, D 4). It is in a natural-gas and oil region and has oil mills, ice plant, cotton mills, and a broom factory. Cotton, corn, and oats are raised extensively. The city contains a city hall and a public library, and shops of the Houston and Texas Central System. Mexia has adopted the commission form of government. Pop., 1900, 2393; 1910, 2694.

MEX'ICAN ARCHÆOLOGY. Among the many tribes which occupied Mexico in former times six may be said to have attained a considerable degree of culture. The Nahuas, whose chief seat at the time of the Spanish Conquest was in the valley of Mexico, had come from the north, and their influence extended, by reason of conquest and migration, southward as far as Costa Rica. It is impossible to state the exact limits of Nahua remains in Mexico, owing to our meagre knowledge of the antiquities of certain parts of the country and the confused traditions of the migrations of the people. The Tarascans were settled in what is now Michoacan, the Mixtecs and Zapotecs in Oaxaca, and the Huaxtecs, linguistically a branch of the great Maya-Quiché family, in northern Vera Cruz. The Totonacs, whose territory lay between that of the Huaxtecs and Nahuas, had a distinct culture, although undoubtedly influenced by both of the former peoples. To the east of the Isthmus of Tehuantepec, and extending eastward over the states of Chiapas, Tabasco, and Yucatan, and southward through Guatemala to northern Honduras, are the remains of the Maya-Quiché family, whose civilization was in many respects the most advanced in ancient America. This region is geographically as well as culturally a part of Central America.

The remains found in Chihuahua show an ancient culture similar to that which existed in the valleys of the Gila and Salt rivers in Arizona, but of a slightly higher grade. The people seem to have reached an intermediate stage between the Nahuas on the south and the Pueblo peoples on the north, but nearer the latter than the former. In this region the ruins of Casas Grandes (q.v.) are the only noteworthy group. The pottery from the vicinity of this ruin is of an advanced type and somewhat resembles the ceramics of Arizona and New Mexico, but it has distinct peculiarities and bears the marks of contact with the people of the south. In the dense forests of the State of Tamaulipas, on the coast of the Gulf of Mexico, ruins have been reported which are related to the culture of the south, and probably belong to the Huaxtec or Totonac peoples. The northernmost great ruin belonging to the high culture of central Mexico is La Quemada in Zacatecas, an immense structure that has been but little studied. The ceramic art of these and other neighboring sites is peculiar and represents a number of superimposed styles. In Michoacan the Tarascan ruins of Tzintzuntzan bear some resemblance to those of La Quemada. This region of the Tarascos has been little explored. The great ruins of the Nahuas include Tula, Teotihuacan, Xochicalco, Tepoztlan, Cholula, and Tenochtitlan, now the city of Mexico. The last named was the capital of the Aztecs, the predominant branch of the Nahuas, at the time of the Conquest. It was founded in 1325 and was leveled to the ground by Cortés in 1521. Underground in the city of Mexico are buried a vast number of objects that excavations constantly bring to light. The famous sacrificial stone and calendar stone were uncovered in 1790 by accident near the site where they had formerly been placed in the ceremonial centre of the Aztec capital. In the Huaxtecan and Totonacan districts are the ruins of Papantla, Misantla, Centla, Tusapan, and Cempoalla; while in the State of Oaxaca, Monte Alban, the ancient capital of the Zapotecs, is one of the most stupendous ruins in Mexico. Mitla, in the same district, belongs to a different style and a later period. In the Maya region are the remains of hundreds of cities, the most important of which are Palenque, Naranjo, Piedras Negras, Menché, Seibal, Tikal, Labna, Kabah, Uxmal, Chichén-Itzá, Quirigua, and Copan.

In the arts the ancient Mexicans show a surprising progress. For the architecture of ancient Mexico, see ARCHÆOLOGY, AMERICAN; MITLA; PALENQUE.

Sculptures in stone are found, ranging in size from the small amulets, representing deities, and designed as personal ornaments, to monuments of colossal size, such as the so-called Mexican calendar stone and the great stelæ of the ruins of Quirigua. In wood carving the Mexicans displayed even greater skill than in the working of stone. The famous zapote-wood lintels of Tikal, the wooden drums, and the atlatls, or throwing sticks, splendidly carved and in some instances covered with gold leaf, attest their proficiency in this branch of art. Carving, whether in stone, wood, bone, or shell, was done with stone or copper tools. Jadeite, emerald, rock crystal, turquoise, and serpentine were carved into numberless varieties of personal ornaments, chiefly in the territory of the Mixtecs and Zapotecs of Oaxaca, and by the Mayas in the mountainous parts of Chiapas. The Nahuas and Zapotecs fashioned mosaics on wood, shell, and clay, using bits of shell, jadeite, turquoise, obsidian, mother-of-pearl, and hematite to form the designs

In the ceramic art the products of the several civilized nations are distinct, and we may determine their provenance with a certain amount of exactness. We must take account of the historical succession of different styles in any one locality, as will be explained presently. The terra-cotta figures of the Jalisco district, the ware from the vicinity of Cholula, the funeral urns from the Oaxaca valley, and the pottery from the Maya region are characteristics of each centre. In metallurgy we find the ancient Tarascos, the Aztecs, Totonacs, Mixtecs, and Zapotecs were very skillful in the manipulation of copper into axes, tweezers, rings, rattles, and bells. Beautiful objects of gold have been found in the Matlaltzinca region near Toluca and in the Mixtecan and Zapotecan areas, which are the very highest achievement of the ancient American goldsmiths. Ear, nose, and lip ornaments, beautiful bells, some representing symbolic faces and animals' heads, beads, circular breastplates, the copilli or crown of rulers, and even remains of armor made of the precious metal have been found in ancient graves during recent years. Unfortunately the greater part of these finds go to the melting pot.

The ancient Mexicans believed in a future life which was graded according to the manner of death, and among the Zapotecs they had elaborate funeral ceremonies and sacrificed slaves to assist the shades of important persons on their journey to paradise. They had greater and lesser deities. The principal god of the Aztecs was Teotl, who was worshiped as a supreme being. Next to Teotl, Tezcatlipoca, a wizard god, was venerated as the soul of the world, who rewarded the righteous and punished the unrighteous. The great beneficent god was Quetzalcoatl among the Nahuas, called Kukulcan by the Mayas, the great feathered serpent deity. He seems to have been an early Maya god taken over by the Nahua at a time when they were profoundly influenced by the ascendant Maya civilization. He invented the arts and taught the people wisdom by his laws. According to his various attributes he appears under different names, as do many other gods of the Mexican pantheon. Tlaloc was the god of rain, and among the Aztecs, Huitzilopochtli, the terrible war god, was patron and protector. There were gods of the hunt and chase, of play, flowers, wine, merchants, trickery, lust, and so forth, while each trade and occupation had its own patron deity. The religious rites were elaborate and prescribed with minuteness. The multiplicity of gods required a great number of priests and priestesses, who were almost as highly venerated as the deities they served. There were degrees of priesthood and religious orders and fixed and movable festivals. The great teocallis, or god houses, were commanding edifices of stone, built on high truncated pyramids with annexed buildings. Their idols were many and hideous, smeared with the blood of human and animal sacrifices.

Among certain of these civilized tribes we find artificial flattening of the head; also trepanation, and decoration of the teeth by filing and interlaying with certain stones, such as jadeite, turquoise, obsidian, hematite, and rock crystal. Labrets, or lip ornaments, made of obsidian and gold, were inserted in holes in the lower lip; U-shaped ornaments of obsidian and shell were hung from the nose, and large ornaments were inserted in incisions in the ears. Many of the musical instruments are still extant, and we find in various museums examples of the teponoztli, the horizontal drum, made from a log of wood hollowed out on the under surface and having two tongues cut on the upper one, which were beaten with rubber-tipped sticks. Among the instruments were the upright drum, of a hollowed log of wood, with skin-covered top, beaten with the hands; flageolets, whistles, and rattles of clay; trumpets; and rattles of shell and notched human bones from the arm or leg, rasped with a bone or shell. Painting was another art in which the ancient Mexicans had made remarkable progress. This is shown by the mural paintings of Teotihuacan, Mitla, Chichén-Itzá, and Santo Rita. One of the most important sources of information for the study of ancient Mexico is found in the existing pictorial and hieroglyphic codices, or books. As is well known, several of the tribes of Mexico had attained a degree of culture at the time of the Spanish Conquest that led to the recording of events, not only on stone bas-reliefs and sculptures, but on material of a more perishable nature. These codices were on strips of deerskin, the surface of which was covered with a thin coating of stucco. They were folded screen fashion, and the paintings were on both sides. The Mexicans had furthermore invented a kind of paper. In Mexico proper, in addition to bark paper, a paper was made from the leaves of the maguey plant, *Agave americana;* this paper they also sized with a coating of lime.

One of the things which impressed Cortés, when he first came in contact with the messengers sent out by Montezuma, was that some of them were busily employed in making paintings of the Spaniards; their costumes, arms, and different objects of interest giving to each its appropriate color. These paintings were to convey to Montezuma an idea of the conquerors in picture writing, and are the first notice we have of its existence in ancient America. In symbolic and picture writing the Mayas approached very closely to phoneticism, and recent progress has been made in an interpretation of the codices of the Nahua and Mixtec group, as well as signal success in the decipherment of the hieroglyphics of the Mayas, preserved in codices, tablets, and stelæ. Of the latter class of inscriptions certain dates and methods of counting have been worked out, and in some instances about 40 per cent of the inscriptions have been successfully deciphered. Besides the two known systems of pictographic and hieroglyphic writing explorations in Oaxaca have recently revealed a third and distinct form of inscription among the Zapotecs.

The complex calendar system of the Tarascos, Nahuas, Mixtecs, Zapotecs, Totonacs, and Mayas is the same and is a remarkable evidence of the high culture which they had attained, but the Mayas had more extended measures for the computation of time than the Nahuas. Recent investigation of the Maya calendar revealed various periods and elaborate computations and a knowledge of the movements of certain planets. The year was divided into 18 months of 20 days each plus 5 days added after the last month to round out the true solar year. Each of the 20-day periods had its own name and symbol, but the days were not numbered from 1 to 20, but from 1 to 13. By this method of numeration the day bearing the same name and number did not recur until the 13 months had elapsed; this made a period of 260 days, which, among the

Aztecs, was called Tonalamatl; it was a year within a year and was used for divinatory or religious purposes. There were, also, many other intricacies in the Mexican calendar, some of which have not yet been explained.

Pre-Columbian history has been restored in the rough over most of Mexico and Central America, and in some regions, particularly among the Maya, the dating of sculptures and structures seems to be upon a very exact basis. The style of sculpture in the monolithic monuments and the mechanics of masonry in the stone temples pass through a natural development in which successive improvements give a test of age. The native dates inscribed on many of the ancient monuments of Yucatan, Guatemala, and Honduras agree with the positions of the monuments according to the tests of age given above. It was long thought impossible to correlate these dates with the European calendar because the fashion of counting time had changed somewhat before the coming of the Spaniards and the cities where the old-style dates occurred were not mentioned in extant traditions, although the history in the Maya Chronicles, or Books of Chilan Balam, extended back to almost the time of Christ. But an old-style date was found at Chichén-Itzá, a city prominent in these chronicles, and this date had to be placed in one of the known occupations of the site. There was only one date that fitted the conditions and this fortunately fitted very nicely the mass of traditions, the other inscriptions, and the theoretic arrangements according to style.

The earliest Maya cities were in the southern part of the area. Copan and Tikal show many archaic monuments as well as others that run the gamut of change towards the higher products. Quirigua, Seibal, Yaxchilan, and Piedras Negras offer examples of more finished work of what we may call the Great period. Architecture did not begin to develop as soon as sculpture and it was many centuries before some of the best features were accomplished. In fact the finest buildings date from a sort of renaissance that took place in northern Yucatan after all the early cities of the south had been abandoned. Labna, Kabah, Uxmal, and Chichén-Itzá afford many beautiful examples of late architecture. Finally, there was a short period when conquerors from the highlands of Mexico held Chichén-Itzá and after this a complete breaking down of the Maya political structure. Mayapan was the last great Maya city to be abandoned, in 1442. Learning was still maintained by means of books when the Spaniards arrived. The historical periods as determined by the monuments and chronicles are as follows:

Protohistoric period, before 160 A.D.
Archaic period, 160 A.D. to 455 A.D.
Great period, 455 A.D. to 600 A.D.
Transition period, 600 A.D. to 960 A.D.
League period, 960 A.D. to 1195 A.D.
Nahua period, 1195 A.D. to 1442 A.D.
Modern period, after 1442 A.D.

Traditional history on the highlands of Mexico is very complete for a short time before the coming of the Spaniards, but does not go back nearly so far as in Yucatan. The system of keeping time records brought confusion if the count ran into many of the 52 year cycles. Fairly accurate history extends back to 1200 A.D. and more or less legendary history for several centuries earlier.

In 1910 an actual stratification of archæological remains, mostly ceramic, was located in the valley of Mexico, the depth of the deposit arguing great age. At the bottom in a thick layer were many examples of a peculiar type of figurine that has since been found to have a very wide distribution over Mexico and Central America. It occurs over the greater part of central Mexico and reappears in parts of Guatemala and Salvador in identical form. Somewhat modified, this type of figurines may be traced through Nicaragua into Costa Rica. Since the Nahua tribes are the only ones common to all these regions there is little doubt that they were the originators and carriers of this art. In some regions, at least, this crude ceramic art is earlier than the known beginnings of Maya sculpture in stone. In the stratifications referred to above the archaic layer is topped by a thick stratum showing finely modeled figurines and richly painted vases. This second layer might perhaps be called Toltec, although this term has fallen into disrepute. Maya influence is strong in this second layer, which may extend in time from about 400 A.D. forward for six or eight centuries. There is reason to believe that the period of greatest extension of high culture towards the north, seen at La Quemada, etc., came near the end of this Toltec period, or from 1000 to 1200 A.D., which also boasted such Imperial centres as Teotihuacan, Tula, and Cholula. On the surface is a shallow layer that corresponds to the post-Toltec or Aztec culture. Although the Aztec capital was not itself founded till 1325 it is reasonable to suppose that the civilization of which it was the supreme example was already established. This late Mexican culture was doubtless a direct outgrowth of the more brilliant one of the Toltecs, who were possibly of the Nahua stock. In Zapotecan ruins we can likewise discern a chronological sequence. Monte Alban belongs to an earlier era than Mitla. This important question of primitive history is now engrossing the attention of Mexican and Central American archæologists.

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MEXICAN HAIRLESS DOG. See HAIRLESS DOG.

MEXICAN JUMPING BEAN. See JUMPING BEAN.

MEXICAN LITERATURE. Modern Mexico, despite the surprising advance of the past quarter century, has been so far outstripped in the material elements of civilization that the people of more progressive nations are apt to forget the time when its capital was the intellectual and artistic centre of the New World. The intellectual life of Mexico, therefore, is not of modern creation, but dates back to the third decade of the sixteenth century, which the early *conquistadores* marked by the introduction by Viceroy Antonio de Mendoza, in 1535, of the first printing press, to be followed shortly, late in 1551, by the establishment of the second university upon the American continent. That neither of these establishments was a matter of mere formal enactment is shown by the creditable list of the writers of that century who were connected as teachers or pupils with the early educational institutions and whose works bear the imprint of the native Mexican press, whose list of extant works printed before 1600 embraces some 116 titles. (J. García Icazbalceta, *Bibliografía mexicana del siglo XVI*, Mexico, 1886.)

Any study of Mexican literature naturally begins with the few survivals of primitive picture writing. These hieroglyphs so far approached writing as to give clearly names, places, and the date of events—some of which are accurate—as far as the twelfth century, while more vague traditions extend several centuries further back. Most of these records belong to that aboriginal branch of Nahua stock known as the Toltecs, but the famous *Popul-Vuh*, of Quiché origin, also mentions names and places of Mexican legendary history. The meagre details of these records were supplemented, within a century after the Spanish Conquest, by so-called histories, written by educated natives from the above sources, aided by oral tradition. These works consist of songs, ordinances, memoirs of the native kings, and accounts of the Spanish conquerors. Without them it would now be impossible to read the few extant sources; and if some of the early Church fathers are to be blamed for their fanaticism in destroying hieroglyphs, others deserve equal credit for their care in preserving the remaining few and in training natives who could still unravel their meaning.

Most writers of the early colonial period were natives of the Old World, whom matters of church or state called to the New. Among those works of the sixteenth century which relate to early native history we may mention Motolinía's *Historia de los Yndios de la Nueva España* (1541), Sahagún's *Historia de las cosas antiguas de los Indios* (1566), and Molina's *Vocabulario* (1555), a Castilian-Mexican work of 249 pages, one of the products of Juan Pablo's first printing press. The work of these men was largely utilized by Torquemada in his *Monarquía Indiana* (1615), a work for which Alamán bestows upon him the title "the Livy of New Spain." Above the names of the adopted European chroniclers stand those of Tezozomoc, son of the last Mexican Emperor, Cuitlahuac, whose *Crónica Mexicana* (c.1600) is an admirable companion volume to Friar Diego Durán's *Historia de los Indios de Nueva España y islas de tierra firme* (1581), up to that time the most complete chronicle of the ancient Mexicans, and Fernando de Alva-Ixtlilxochitl (1568–1648), the original chronicler of the Texcuco royal line, whose work, though not rigorously correct in chronology, in volume and importance surpasses all his predecessors. It is to these two native writers that we owe the interpretation of the early Mexican hieroglyphs then in existence.

The chroniclers who treated merely of the Conquest did so from a European standpoint, and for this reason do not greatly concern us here. Still, mention must be made, at this point, of the *Crónica de la Nueva España*, written by Francisco Cervantes de Salazar, in Mexico City, from 1560 to 1567, utilized in manuscript by Herrera for his own *Historia general*, and published for the first time by M. Magallón, under the auspices of The Hispanic Society of America (Madrid, 1914). It is important both as history and as literature.

Among the Creole population of the sixteenth century, however, there were some poets of note. Prominent among these were Francisco de Terrazas, who was eulogized by Cervantes, but only a few of whose poems have been preserved (consult Gallardo, *Ensayo de una biblioteca española*, vol. i, columns 1003–1007, and García Icazbalceta, "Literatura mexicana: Francisco de Terrazas y otros poetas del siglo XVI," in the *Memorias de la Academia Mexicana*, vol. ii, pp. 357–425); Saavedra Guzmán, whose most famous poem, *El peregrino indiano* (Madrid, 1599), adds rather to his reputation as chronicler than as poet; González de Eslava, whose *Coloquios espirituales y sacramentales y canciones divinas* (Mexico, 1610) are a most interesting example of the primitive Mexican drama; and Bernardo de Valbuena, whose *Grandeza mexicana* appeared in Mexico, 1604.

Though the modest literary product of the seventeenth century may to some extent exemplify the intellectual decadence of New Spain during that period, yet it illustrates in one phase the aptitude of the *mestizo* caste for music and for poetry—an aptitude which displayed itself in both Castilian and Latin verse. Easily the leader of this period stands the poetess Juana Inés de la Cruz (1651–1695), a leading personage at the viceregal court, and later a nun, who dazzled her contemporaries by her learning, and whose subtle and suggestive verse gained for her the title "the tenth Muse." Another easy and correct versifier of the period was the Pueblan Matias Bocanegra, whose popularity lasted well into the succeeding century.

The making of verse at that time was simply a pastime, so a comparatively small output has survived until our own day. The man of letters par excellence of the century was the diligent and versatile Carlos de Sigüenza y Góngora (1645–1700), whose writings, poetical and prose, embraced a wide variety of literary and scientific subjects. He held the post of Cosmographer of New Spain, and for many years filled the chair of mathematics in the University of Mexico. The most noted colonial dramatist of the century was Eusebio Vela, who, if not equal to the leaders of the Spanish stage, surpassed many of those of the second rank. Juan Ruíz de Alarcón y Mendoza, the dramatist, was of Mexican birth and education, though his mature work was produced in Spain. The theological works of the time bore the names of many native Church fathers; likewise the best work on the early compiling of the laws of the Indies was that of Rodrigo Aguiar y Acuña (died 1629). In the realm of scientific literature the work of Enrico Martínez, *Reportorio de los tiempos y historia natural desta Nueva España* (1606), and that of Friar Agustín de Vetancourt, *Teatro mexicano* (1698), fittingly open and close the century.

The eighteenth century in New Spain was marked by a more extensive if less notable literary culture. This was especially true of the reign of Carlos IV, when public functions were the scenes of notable contests of poets and orators, many of whose productions were favorably mentioned in Europe. The book trade with Madrid and other Spanish cities was very flourishing and some especially fine editions of classical authors were printed in the Creole capital. Large and well-selected private libraries were common, both here and in the provincial towns. It was the period for the collection of archives and the writing of local history—a work in which the names of Veytia (1718–1779) and Morfí (died 1793) hold a prominent position. Spanish-American journalism is represented by the monthly gazette (1728–39) of Francisco Sahagún de Arevalo; by the *Gaceta de Literatura* (begun 1768) of José Antonio de Alzate (1729–90), whose periodical did much to stimulate intellectual effort and develop a correct literary sentiment; by the *Mercurio Volante* (begun 1772) of José Ignacio Bartolache, largely a medical journal; by the *Gaceta de México*, a fortnightly publication from 1784 to 1806, devoted to general news and literary and scientific discussions, and after that date a biweekly; and the *Diario de Méjico* (1805) and the *Diario de Vera Cruz* (1805), the former devoted to literary and statistical matters and the latter a commercial sheet. Despite the strict censorship of all these periodicals they exercised a most beneficial effect upon public opinion at the close of the century.

In the literary production of the nineteenth century the work of the Mexican historians easily leads at home and occupies a prominent place in the world at large. An important work as collector of historical documents was done by José Fernando Ramírez. Among historians of lesser note may be mentioned Mora and Zamacois. Of unusual excellence is the work of Bustamante (died 1848), whose volumes treat of the revolutionary period and of the beginnings of the American war. The leader of his age, and still easily the foremost Mexican historian, was Lucas Alamán (died 1853), whose work as statesman during a trying period has been eclipsed by his greater work as the historian of that period. His *Disertaciones sobre la historia de Méjico* (3 vols., 1844–49) cover the viceregal period, and these are supplemented by his *Historia de Méjico* (5 vols., 1849–52), continuing the narrative to the middle of the century. Among the more recent historians the greatest figure is that of Manuel Orozco y Berra (1816–81), who crowned a life of public service and valuable archæological research by devoting his last 20 years to his *Historia antigua de México*. Closely allied with these is the work of Antonio García Cubas, whose *Diccionario geográfico, histórico, y biográfico de los Estados Unidos Mexicanos* (1889) is a model of its kind.

In the realm of pure literature the physician-poet Manuel Carpio (1791–1860) was well known for his vigorous descriptive verse, of which the most important example is *La cena de Baltasar*. His firmness and moderation in political life and the erudition and charm of his poems easily render him the most popular Mexican poet of the century. Ignacio Manuel Altamirano (born 1834), a noted liberal orator, is famous both as a poet and as a novelist. His poems are less vigorous in description than those of Carpio; the best known of his novels, *Clemencia*, is of considerable merit. To Rodríguez Galván is given the credit of the first national drama, but his work has been surpassed by Fernando Calderón (1819–45), whose *Reinaldo y Elena*, *Zadig*, and others gave promise of much better work had he lived to complete it. In comedy the name of Manuel E. Gorostiza (1789–1851) stands supreme. His comedies, of which the most famous are *Indulgencia para todos* and *Contigo pan y cebolla*, still hold popular favor. In addition to an active military and diplomatic career he organized the present *Biblioteca Nacional* and greatly advanced popular education throughout the Republic.

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MEXICAN POPPY. See ARGEMONE.

MEXICAN SISAL. See HENEQUEN.

MEXICAN SUBREGION. In zoögeography, a subdivision of the Neotropical region which embraces Central America and the low, hot coast regions of Mexico to the mouth of the Rio Grande on the east and about to the border of the plains of Durango on the west. Between

these the northern fauna and flora are continued along the summit of the Cordillera as an entering wedge reaching south to Nicaragua. It has many species peculiar to itself, but no large groups. Many northern as well as southern forms extend their range into this middle region, as might be expected; and views differ as to where its boundaries should be drawn. (See SONORAN REGION.) On the whole, its affinities are South American. See DISTRIBUTION OF ANIMALS; NEOGÆA; NOTOGÆA.

MEXICAN WAR. The war between the United States and Mexico in 1846–48. It was the result of a series of outrages upon American citizens, giving rise to claims of the United States citizens on the government of Mexico, the recognition of the independence of Texas by the United States (1837), the annexation (1845) of Texas to the United States, in the face of bitter opposition on the part of Mexico, herself torn with revolution and contending factions, and finally of a dispute regarding the boundary of Texas, the United States claiming the Rio Grande as the boundary, while Mexico held that Texas did not extend farther south than the Nueces. Mexican hostility towards the United States had been further stimulated by a violation of the Territory of Mexico due to the indiscreet precipitation of Commodore Jones of the American navy, which occurred in October, 1842. Another cause of friction was the sympathy of the people of the United States for the Texans, which manifested itself in material assistance at critical moments. The war was essentially a popular movement both in Mexico and in the United States. The utterances of contemporaneous journals reveal the gross misconceptions entertained by the two peoples of each other, as well as the bitter feeling which existed in consequence of the causes enumerated above. So far as the Texas-Mexican question is concerned one cannot but feel the justifiableness of Mexican suspicion and resentment against the United States. The immediate occasion of the breach of diplomatic relations in 1845 was the annexation of Texas. During the fall of 1845 a large part of the small regular army of the United States was assembled under Gen. Zachary Taylor at Corpus Christi, near the mouth of the Nueces in Texas, and on March 12, 1846, under orders from the United States government, Taylor advanced into the territory the possession of which was then in dispute. After a march of 16 days he reached the Rio Grande at a point opposite to the Mexican city of Matamoros. A week earlier, on the twenty-first, the United States Minister to Mexico, Slidell, unable to negotiate a treaty in accordance with President Polk's directions, or even to secure official recognition, received his passports and started on his return to the United States. The Mexican army at this time numbered at least 30,000 of all arms and comprised, besides troops of the line, the active battalions of the states and the local national guards of the cities. The cavalry (lancers) were excellent horsemen, fairly disciplined, but indifferently mounted and poorly armed; the artillery, officered partly by foreigners, were good gunners, but the arm lacked mobility; the infantry were well drilled, but were armed with muskets of ancient pattern. An undue number of general officers (politicians rather than soldiers) and an inefficient general staff completed the Mexican resources for war. The effective power of the Mexicans, however, was enhanced by the fact that they represented the defense, that they served among friends, and that they often fought behind strong fortifications. The American army was inferior in numerical strength to the enemy. At the close of 1845 the maximum strength was 7883. What it lacked in numbers, however, was made up in fighting quality. It consisted of two regiments of dragoons, four of artillery, and eight of infantry, with the usual staff corps. The dragoons were well disciplined, drilled as light cavalry, and armed with carbines and sabres; the artillery garrisoned the fortifications, but had little instruction in gunnery, excepting one company in each regiment organized as light artillery, which had reached a high standard of efficiency; the infantry, well disciplined and familiar with the use of arms, were distributed among a number of small frontier posts and never in large bodies; the officers, a majority graduates of West Point, were generally of superior ability, with the experience and self-reliance gained in Indian service and independent command. The navy of the United States, although small, was exceedingly efficient. The Mexican Republic had only a few small steamers and sailing vessels, and these principally on paper. Taylor's command hardly comprised 3000 effectives upon its arrival opposite Matamoros on March 28, 1846. Taylor immediately fortified his position and established a base of supply at Point Isabel. The mouth of the Rio Grande was blockaded by the small naval force accompanying the American army, and two vessels with supplies for the Mexican army were warned off and returned to sea. General Ampudia, who was in command at Matamoros from April 11 to April 24, protested vigorously against the occupation of disputed territory by General Taylor and insisted that, pending a settlement of the boundary dispute, the American army should be withdrawn to the Nueces. On April 24 General Arista superseded Ampudia and at once decided to take the offensive and cross the Rio Grande, notifying Taylor that he considered hostilities already to have begun on the part of the United States. On the twenty-fifth General Taylor learned that a large force of cavalry had crossed the Rio Grande some miles above his position, and sent a small squadron of the Second Dragoons under Captain Thornton to obtain definite information. While endeavoring to execute the order, Thornton, whose guide had deserted, found his command surrounded by a Mexican cavalry force of more than 500, and in an attempt to cut his way out lost one officer and eight men killed and two men wounded, and, with the remainder (46), was captured. Taylor notified his government that the first blow had been struck and called upon the governors of Louisiana and Texas for 5000 volunteers. On the thirtieth General Taylor, leaving a regiment of infantry and two companies of artillery to garrison an earthwork known as Fort Brown (see BROWNSVILLE, TEX.), in front of Matamoros, proceeded with the remainder of his command to Point Isabel in order to complete his communications. During his absence the Mexicans attacked the fort vigorously, but to no avail. As he was returning (May 8) he encountered Arista, who with 6000 men and 10 guns barred the road at a place 9 miles from Matamoros, known as Palo Alto. Taylor's force numbered 2300 officers and men

and 10 guns. After an indecisive fight of four hours (see PALO ALTO) Arista fell back to Resaca de la Palma, with a loss of over 600 in killed and wounded. General Arista's report put his loss at 252, dispersed, wounded, and missing. The American casualties comprised 7 killed and 47 wounded. On the following day Taylor continued his march. Arriving in front of the Mexican position, a low ridge commanding the road to Matamoros, the Americans paused to reconnoitre. On account of the dense chaparral, movements en masse were impracticable, and the infantry were deployed as skirmishers, with the artillery, supported by the dragoons, remaining on the road. Arista had been reënforced during the night by 2000 infantry. As on the day before, an artillery duel ensued, and the Mexican batteries held the Americans at bay for some time, until Taylor sent a squadron of dragoons under Captain May, who gallantly charged, taking the guns, together with the Mexican General La Vega, at the cost, however, of 1 officer and 7 men killed and 10 men wounded. Upon this the enemy gave way and fled from the field, pursued by the Americans, who made many captures, including 14 officers, 8 pieces of artillery, and several standards. The Mexicans, in confusion, retired to Matamoros, many being drowned in crossing the river. Taylor estimated the enemy's loss in this at about 400; that of the Americans as 36 killed and 70 wounded. On May 17 Arista evacuated Matamoros, and on the following day Taylor crossed the Rio Grande and took possession. Previously, on May 11, President Polk had sent to Congress his famous war message, in which he enumerated the wrongs committed by Mexico against the United States and, ignoring Mexico's reasonable claim to the country between the Nueces and the Rio Grande, asserted that "Mexico has passed the boundary of the United States, has invaded our territory, and shed American blood upon American soil. War exists and, notwithstanding all our efforts to avoid it, exists by the act of Mexico herself." Two days later Congress issued a formal declaration of war and threw the onus of striking the first blow upon Mexico. The ensuing three months were utilized by both sides in raising additional troops. Congress authorized a call for 50,000 volunteers, and the regular army was increased to 30,000. On August 19 Taylor marched with 6700 men (including volunteers) upon Monterey, which was held by Ampudia with some 9000 men, of whom 3000 were regulars, and 40 pieces of cannon. Previous to his arrival before Monterey, however, Santa Anna (q.v.) had subverted the government of Paredes and had established himself in power. Orders had been issued to Commodore Conner to place the Mexican coast under blockade, but not to obstruct the return of Santa Anna, who was believed to be in favor of peace with the United States. The American army arrived in front of the town September 19, attacked on the twenty-first, and after three days of severe fighting the defenses were taken by assault and the Mexican general capitulated, being permitted to march out "with the honors of war" and an armistice of eight weeks being agreed upon. (See MONTEREY, BATTLE OF.) The Mexican losses were estimated at nearly 1000; the American at 488. General Scott withdrew from Taylor the greater part of his army and instructed Taylor to establish his headquarters at Monterey and refrain from further offensive operations. Through captured dispatches Santa Anna learned of Taylor's depleted force and quietly advanced upon the American position near Saltillo with 20,000 effectives. Taylor's scouts informed him of this in time for him to complete his dispositions for battle. With 4691 men, only 453 of whom were regulars, he awaited Santa Anna at Angostura, near Saltillo and on the road to San Luis Potosí. The engagement which followed, known as the battle of Buena Vista (q.v.), lasted two days (Feb. 22–23, 1847), and more than once the result seemed doubtful, the panic which seized certain regiments of Taylor's volunteers being counterbalanced by the steadiness of the regulars, the effective work of the light batteries, and the gallantry of the Mississippi regiment under Col. Jefferson Davis, afterward President of the Southern Confederacy. Notwithstanding the numerical superiority of the Mexican army, the obstinacy of the defense eventually won, and Santa Anna was forced to withdraw with 4000 killed and wounded. The American casualties comprised 264 killed and 450 wounded. These estimates are only approximate, as the number of killed and wounded in the battle of Buena Vista is uncertain. Soon afterward General Taylor returned home on leave of absence.

While the campaign in northern Mexico was thus progressing, the United States sent expeditions into New Mexico and California. Within three months the American flag had been hoisted at Santa Fe, the navy had planted the flag at San Francisco, and seaports on the west coast of Mexico were blockaded.

About a week before the engagement at Buena Vista, Scott had landed at the Lobos Islands, some 60 miles beyond Tampico and 7 miles from the mainland. He had at his disposal a force of 12,000 men, of whom two brigades were regulars. From Lobos the force proceeded to Anton Lizardo, where it lay inactive for a few days. A sandy beach lying 3 miles south of Vera Cruz was selected as a safe landing place on the mainland. By March 22 the investment of the city was complete, and a formal demand for surrender was made, which met with prompt refusal. For four days the besiegers bombarded the city and the castle of San Juan de Ulua, their fire being replied to with spirit: but on the twenty-fifth the foreign consuls used their influence in the interests of noncombatants and to secure the burial of the dead, and a suspension of hostilities ensued. On the twenty-ninth the city surrendered. (See VERA CRUZ.) After a brief interval the Americans pushed on towards their goal. At the same time Santa Anna, having reorganized his army, marched with more than 12,000 men from the city of Mexico. At Cerro Gordo (q.v.), a pass in the mountains, 60 miles from Vera Cruz, he awaited the invaders, about 8500 strong. On April 14 Scott arrived and on the eighteenth attacked. Although stoutly resisted, by noon the Americans had swept over Cerro Gordo and driven the Mexicans down the road for 10 miles. The spoils comprised 3000 prisoners, including 5 generals, and 40 bronze cannon. The casualties on the Mexican side were fully 1000; on the American side 431. The advance to Puebla was only slightly opposed, and on May 15 Worth's division of 4000 men encamped in the Grand Plaza of this "City of the Angels," in the midst of at least 60,000 hostile citizens, 75 miles from

the Mexican capital. On the seventeenth Scott made a final appeal to the Mexicans in the interest of peace, but in the embittered state of popular feeling it failed. On the contrary, Santa Anna strained every means for the defense of his capital; he appealed to the patriotism of the people, money was freely contributed, and almost every able-bodied man was enrolled for the common defense, until 36,000 men and 100 pieces of artillery were in readiness. Sickness and the discharge of seven regiments of volunteers had reduced Scott's army, but the arrival of 2400 men under General Pierce (afterward President of the United States) brought the total strength of the American forces to 10,738, nearly one-half of whom were recruits. Leaving a detachment of 500 men at Puebla, where 2300 wounded were in hospitals, Scott advanced upon the "Halls of the Montezumas." The city was entered by three roads, each guarded by rocky hills strongly fortified, the most prominent being that of El Peñon, mounting 51 guns, behind which were long and narrow causeways, flanked on one side by fields covered with broken lava and on the other by ponds and marshes. On the east and southeast large lakes added to the military protection of the city; an inner line of fortifications, made doubly impregnable by nature and art, completed the obstacles to a further advance on the part of the Americans. Undismayed by these, however, General Scott summoned his engineers, among whom were Captains George B. McClellan and Robert E. Lee, and a new road was cut, skirting Lake Chalco and by a circuitous route of 27 miles leading to the most vulnerable side of the town. After careful reconnoissance the first impediment, the hill of Contreras (q.v.), was taken (August 20) by an unexpected and desperate assault, with 813 prisoners (including 4 generals), 22 cannon, and thousands of small arms. The attacking force numbered 4500, the defense at least 7000 men, of whom 700 were killed, while the Americans lost about 60 in killed and wounded. Within easy supporting distance, moreover, was Santa Anna's reserve of 12,000 of the finest troops of Mexico. On the same day the strong positions of San Antonio and Churubusco (q.v.) were carried by the divisions of Worth and Twiggs, with further captures of 1800 prisoners, including 4 general officers, and 35 pieces of artillery; the Mexicans losing more than 3000 and the Americans about 1100 killed and wounded. After the "outer walls" had thus been gained, the American advance was again halted, and on August 23 an armistice was agreed upon pending the possibility that the demands of the United States might be acceded to without further bloodshed. This expectation proved futile, and on September 7 the final movement began. After severe hand-to-hand fighting, the defenses of Molino del Rey were carried by the Americans on September 8, and on the thirteenth the castle of Chapultepec was stormed. On the fourteenth the Mexican army evacuated the capital, and General Scott made his entry into the city. The total American losses during the operations in the valley of Mexico were 2703, including 383 officers; that of the Mexicans 7000 killed and wounded and 3730 prisoners of war. The spoils of war comprised 20 standards, 132 cannon, and 20,000 small arms. General Scott established his headquarters in the city of Mexico, was reënforced to an aggregate of 20,000 men, and levied a tax of $150,000 upon the municipal government, to be largely expended for the comfort of the sick and wounded. On Feb. 2, 1848, a treaty of peace between the United States and Mexico was signed at Guadalupe Hidalgo. (See GUADALUPE HIDALGO, TREATY OF.) The total number of American regulars who served in Mexico and its borders during the war was 21,509; of volunteers, 22,027.

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MEX'ICO (Sp. *Méjico*, mā'hĭ-kō). The most southern country of North America, bounded on the north by the United States and the Gulf of Mexico, east by the United States, the Gulf of Mexico, and the Caribbean Sea, south by British Honduras, Guatemala, and the Pacific Ocean, and west by the Pacific Ocean. It extends through 18 degrees of latitude, between the parallels of 15° and 33° N., and through 30 degrees of longitude, between the meridians of 87° and 117° W., and has an area of 767,055 square miles, including the islands. Though usually considered a tropical country, it lies in the temperate and torrid zones, the tropic of Cancer crossing it nearly midway between its northern and southern boundaries. The boundary between Mexico and the United States is 1833 miles in length, the northern extremity of the country being its widest portion. The Isthmus of Tehuantepec, a little more than 100 miles across, is the narrowest part. The country has 1727 miles of coast line on the Gulf of Mexico and the Caribbean Sea and 4574 miles on the Pacific Ocean. In form Mexico is not unlike a cornucopia with its narrow end tapering towards the southeast; and the country is concave on its eastern and convex on its western coast lines. In the southeast is the low, wide peninsula of Yucatan, projecting northward; and in the northwest is the long narrow peninsula of Lower California, paralleling the mainland through 9 degrees of latitude and separated from it by the Gulf of California.

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MEXICO.
SCALE OF STATUTE MILES.
157 MILES TO THE INCH.
Capital of Country: Capitals of States:
Railroads: Finished Proposed
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GULF OF MEXICO
Gulf of Campeche
Gulf of Tehuantepec
Gulf of Honduras
Delta of the Mississippi R.
TEXAS
ARKANSAS
LOUISIANA
MISSISSIPPI
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Mendez
Cruillas
Linares
Montemorelos
Monterey
Saltillo
Sabinas
Sta. Rosalia
Ciudad Victoria
Soto la Marina
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Tuxpan
Tuxpan
Papantla
Misantla
Jalapa
Vera Cruz
Orizaba
Tehuacan
Puebla
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Acapulco
Oaxaca
Tehuantepec
Salina Cruz
Juchitan
Tuxtla
San Juan Bautista
Frontera
Laguna de Terminos
Carmen
Campeche
Merida
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Belize
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Guatemala
Zacapa
Salama
Totonicapan
Tapachula
Mazatenango
Chiquimulilla
Escuintla
Amatitlan
Comayagua
Tegucigalpa
Omoa
Truxillo
Ruatan
Cape Gracias a Dios
Cape Catoche
Cape Antonio
Cape Corrientes
Cape Hermanos
Cape Kimbergris
Cape Tiburon
Cape Sable
Cape Blanco
Cape Mala
Cape Rodrigo
Cape Tres Puntas
Cape Gracias a Dios
Cape Tres Puntas

Topography. The surface of the main portion of Mexico rises steeply from the narrow coast lands and more gently from the great depression of the lower Rio Grande to the broad table-land of the interior. This central plateau is dominated by mountains whose great height is masked by the elevated lands above which they rise. The peninsula of Yucatan, on the other hand, has nothing in common with the main mass of Mexico in its conformation or geological structure, being a very low, level region.

The east coast is of monotonous aspect, low, flat, and sandy; but in the State of Vera Cruz, where the lofty mountain edge of the plateau most nearly approaches the coast, the inconspicuous shore line is forgotten by all who approach it from the gulf, for the majestic summits of the interior are visible far out to sea and dominate the view. Long reaches of sand banks stretch in front of the shore nearly as far south as Vera Cruz, shielding the shallow waters between the mainland and the banks from the sea waves. The Pacific shore is also generally low, though here and there relieved by spurs from the cordillera that extend to the ocean. Most of the many small islands near the coasts are uninhabited, though some of them are very fertile. The most important islands are El Carmen, the largest Mexican island in the Gulf of Mexico; San Juan de Ulua and Sacrificios, at Vera Cruz; Mujeres and Cozumel, in the Caribbean Sea; Guadalupe and Cedros, in the Pacific off the coast of Lower California; the Tres Marías group, near the entrance to the Gulf of California; and the Revilla Gigedo group, far off the coast of the State of Colima, to which it is assigned.

There are no good natural harbors on the Gulf of Mexico coast, but this impediment to commerce has been partly relieved by the expenditure of large sums. Jetties at the entrance to the port of Tampico have increased the depth from 9 to 24 feet; similar improvements have given Puerto Mexico a depth of 30 feet at the entrance to the Coatzacoalcos River; and breakwaters at Vera Cruz have turned that dangerous roadstead into a safe and commodious harbor. The best natural harbors are on the Pacific coast, those of Acapulco, Manzanillo, Guaymas, and La Paz, the chief town of Lower California, being most conspicuous. That of Acapulco is one of the finest natural harbors in the world. These excellent Pacific coast ports have, however, the disadvantage that they are shut off by mountains from the busiest parts of the Republic, and therefore do not have a large share of the country's trade.

The east and west edges of the great central table-land are bordered by two cordilleras or high mountain ranges. The Sierra Madre Oriental, on the east, runs nearly parallel to the Gulf of Mexico, at distances of 10 to 100 miles from the coast, the land gently sloping from the foot of the mountains to the sea. The Sierra Madre Occidental, on the Pacific side, is on the whole nearer the coast. In the south the main western cordillera trends towards the east, and in the states of Michoacan and Guerrero there is a coastal range, with a broad fertile valley stretching between it and the main chain. The most continuous range is the Sierra Madre Occidental, which extends from Arizona to Oaxaca with a mean elevation of over 10,000 feet. The inland faces of the two border ranges descend somewhat gently to the central table-land, while their seaward sides are more precipitous, presenting many scarps and cliffs and furrowed with deep chasms or gorges. The border ranges gradually approach one another towards the south, and the narrowing plain between them terminates, south of the city of Mexico, in a labyrinth of mountains culminating in giant peaks, such as Popocatepetl and Orizaba. They include an irregular line of mountains, known to the Mexicans as the Cordillera de Anahuac, extending east and west across the country without forming a continuous chain, but embracing most of the active volcanoes.

The numerous mountain peaks, mostly volcanic in origin, between the twenty-second parallel and the Isthmus of Tehuantepec, are the most elevated features of the topography. The volcanoes are of recent formation and most of them are either extinct or quiescent, the exhalations of the latter consisting only of aqueous and sulphurous vapors. The loftiest of these mountains is the volcano Orizaba (Citlaltepetl, Star Mountain, 18,250 feet in height), situated to the north of the line of the railroad between Vera Cruz and the city of Mexico. It has not been in violent eruption since the middle of the sixteenth century, and has been nearly quiescent since the middle of the nineteenth century, though vapors and sulphurous jets are still ejected from its crater, which, however, is usually filled with snow. Popocatepetl (Smoking Mountain, 17,520 feet), the most widely known of the Mexican volcanoes, is comparatively easy of ascent. Its yawning crater is over half a mile in circumference and 250 feet deep, and through the melted snow around the orifice frequent jets of gas emerge. Orizaba and Popocatepetl are among the most perfectly formed of volcanic mountains. Ixtaccihuatl (White Woman, 16,960 feet), which rises to the north of Popocatepetl, is not of volcanic origin, though there are many legends regarding its ancient activity. The extinct Nevada de Toluca (14,950 feet) rises to the south of the town whose name it bears, a lake from melting snows partly filling its crater with pure cold water in which fish of a peculiar species are found. Malinche (13,460 feet) rises in isolated majesty from the middle of the Tlaxcala plateau. On the verge of the central plateau bordering the Sierra Madre Oriental is Cofre de Perote (13,400 feet), another great eruptive summit now extinct, which owes its name "coffer" to the quadrilateral form of its summit, and is famous for the Chinacamote cavern on its western side, said to be over 30 miles in length, but difficult of access because its floor is strewn with large rocks. Colima (12,970 feet), not far from the Pacific and the most active volcano in Mexico, is in an almost incessant state of ebullition. The view from its summit, during its periods of quietude, is unrivaled, embracing the ocean, widespread plains, and the glittering snow crown of Popocatepetl far to the east. The forested Tancitaro, nonvolcanic (12,650 feet), is in the same latitude as Colima, but nearer to the Sierra Madre. As the limit of perpetual snow is a little under 15,000 feet above the sea, only three of these lofty summits, Orizaba, Popocatepetl, and Ixtaccihuatl, have an enduring crown of snow; and considerable glaciers develop only on Ixtaccihuatl. The small volcano of Jorullo (4330 feet) is said by the natives to have suddenly risen above the cultivated plain in a single night near the end of 1759, though its period of construction did not end till 1763. Humboldt made

it famous by the description he received from the natives of its terrific energy. Columns of superheated air still rise from its crater.

The wide table-land or plateau of Anahuac (q.v.), lying between the two cordilleras, slopes from south to north, being from 5000 to 9000 feet high in the states of Mexico and Puebla and falling to 3600 feet at El Paso, on the United States border. Its surface is covered with long-continued outpourings from the volcanoes and the detritus worn away from the mountain slopes, which, according to Heilprin, filled the original depressions, the valleys of to-day having been imposed upon this new surface. The mountains of the plateau, nearly buried by the accumulations of past ages, still rear their heads above the general level, and here and there are continuous ridges or ranges which divide the surface into well-defined basins such as the valley of Mexico, nearly 8000 feet above the sea and completely inclosed by mountains. The rivers of the plateau have cut deep valleys and cañons, some of which are 1000 feet below the general level, extending the warmer influence of the coast lands into the plain. These barrancas, as they are called, are watered by small streams and contrast, by the luxuriance of their vegetation, with the dry and often barren plateau above them. The most famous of the barrancas extend from the neighborhood of Guadalajara through the western mountains to Colima and Tepic. On the whole, the surface of the plateau is so level that there was little difficulty, even before there were wagon roads, in traveling by carriage between the city of Mexico and Santa Fe.

The dry and sandy peninsula of Lower California is traversed by the Sierra de la Giganta, broken in two places and culminating in Mount Calamahue (10,126 feet), in the northern part of the peninsula. Owing to its excessively dry climate and scanty population, this peninsula is still little known. The huge quadrilateral peninsula of Yucatan is projected beyond the continental coast line towards Cuba, has no mountain ranges, and its mean altitude is scarcely above 100 feet.

Hydrography. The form of the central plateau, hemmed in by border ranges parallel with the sea and preventing wet winds from reaching the interior, is not favorable to the development of large fluvial systems. No Mexican river is important for its volume or is valuable for commerce excepting to a very limited extent. All rivers tributary both to the Gulf of Mexico and the Pacific are obstructed by sand bars at their mouth. The longest river is the Rio Grande, which rises in Colorado and for 750 miles forms the boundary line between the United States and Mexico. The waters of its upper course are so far diverted for irrigation purposes that the lower river is almost entirely dry during the dry season. While the Mexican part of its basin comprises 94,000 square miles, the river receives scarcely any perennial stream. Its largest affluent in Mexico is the Río Conchos, which is fed for 200 miles north and south by the east slope of the Sierra Madre Occidental. The Salado tributary comes from the Sierra Madre Oriental, and its name, Salt River, indicates that its waters are rendered saline by their very slow passage through shallow basins. Other tributaries have the same peculiarity, so that they give a brackish taste to the waters of the Rio Grande itself. The Pánuco, the most considerable river of the south tributary to the Gulf of Mexico, rises north of the Mexican valley and empties at the port of Tampico. The Coatzacoalcos, or Snake River, drains the alluvial plain and low mountain district, forming the north slope of the Isthmus of Tehuantepec; small boats ascend it for over 60 miles from its mouth. The most important rivers on the Pacific coast are the Mexcala, or Río de las Balsas (river of the rafts), which, as its name indicates, is navigable to a limited extent in its lower reaches, and the Lerma or Santiago, which rises a little west of the city of Mexico, and about 15 miles from Guadalajara is precipitated over the great falls of Juanacatlan, one of the finest waterfalls in the Western world.

The Lake of Chapala, which receives and discharges the Lerma River, is the largest lake in Mexico; many fine country houses have been built on its shores. Mexico has no really large lakes, though some of the sheets of water, as Cuitzeo and Pátzcuaro, in the State of Michoacan, are famous for their beauty. A considerable part of the valley of Mexico is occupied by six very shallow lacustrine basins, four of the lakes salt. They are the relics of much larger lakes which existed when the Spaniards invaded the country.

Climate. As a whole, Mexico is a hot country, but its climate, if not one of the most salubrious, is among the most delightful in the world; the normal warm temperature is modified by great contrasts in elevations and by the position and trend of the mountain ranges, which influence the force and direction of the winds and the distribution and amount of the rainfall. The climatic differences depending upon the differing altitudes are so great that the vegetable products include almost all that grow between the equator and the Arctic regions. In some large areas, however, uniformity of climate prevails; thus, the great plains of the northern states, hemmed in by mountains from sea influences, have the extremes of temperature characteristic of the continental climate in the United States. On the other hand, the Isthmus of Tehuantepec is entirely included in the wet tropical zone.

Three zones of climate are distinctly marked. The tierra caliente, or hot land, lies along the low maritime zone of the Gulf and the Pacific and includes swampy and sandy coast lands and well-watered plains and slopes leading up to the mountains. The growth of luxuriant tropical vegetation is promoted by a mean annual temperature of 77° F. to 82° F., the mercury seldom falling below 60° F., but often rising to 100° F., and in the sultry districts of Vera Cruz and Acapulco to 104° F. Some places, as the port of La Paz, are among the hottest in the world. The seacoasts are unhealthful, fevers prevail, and in some localities yellow fever and black vomit are endemic. The health conditions may be greatly improved by draining the swamps, as has already been shown at Vera Cruz.

Above the Gulf and Pacific hot zones are the tierras templadas, or temperate lands, from 3000 to 6000 feet above the sea, embracing the higher terraces and parts of the central plateau. The temperate lands rise to a higher elevation in the southern than in the northern states. The mean temperature is from 62° F. to 70° F. and does not vary more than four to five degrees during the year. Thus, extremes of heat and cold are unknown; semitropical products, like those

of southwest Europe, are abundant and to some extent, also, products both of the tropical and cold regions. Around the city of Oaxaca wheat and sugar cane may be seen growing on the same piece of ground.

Above the temperate lands are the tierras frias, or cold lands, 7000 feet or more above sea level, with a mean temperature of from 59° F. to 63° F. Most of the central plateau, with its girdle of mountains, is included in this region, but in great depressions of the surface a warmer temperature and tropical products are found. The less elevated parts of this region produce cereals and apples, while the higher grounds, some of which extend above the snow line, have a sparse vegetation. The lower cold lands are the most thickly inhabited regions in Mexico.

Owing to the differences of temperature and the effect of the mountain ranges upon the direction of the winds, the rainfall is very unequally distributed. During the rainy season, from the middle of May to October, many torrential storms occur in the southern half of the Republic. Little or no rain falls in the winter or dry season. The cold lands receive only about one-fifth as much rain as the temperate lands, except in some of the mountain districts, where the precipitation is heavy. The city of Mexico has a mean rainfall of 30 inches a year, which is somewhat in excess of the general supply of the plateau to the north of it, though the precipitation on the mountain coast lands is two to four times as great. The extreme northern part of the plateau is semiarid, reproducing the conditions that prevail in Arizona and New Mexico. The country lies in the zone of trade winds blowing from northeast to southwest, but, as mentioned above, the trend of the ranges modifies their normal direction. Both the Gulf and Pacific coasts are exposed to violent gales, which often do great damage to shipping.

Geology and Mineral Resources. The mountain ranges are formed chiefly of plutonic and volcanic rocks, such as granites, gneiss, syenites, mineral-bearing trachytes, basalts, porphyries, obsidian, sulphur, pumice, lavas, and tufa. Sedimentary formations are also represented, especially by a carboniferous limestone interspersed with deposits of anthracite. The land consists mainly of metamorphic formations largely penetrated and overlaid by volcanic outpourings and the débris resulting from mountain denudation. The most valuable rocks thus far known are the argentiferous porphyries and schists of Sinaloa and the central plateau. It has not yet been revealed whether the auriferous deposits of Sonora are destined to equal them in economic value. The sandstones of the northern states have produced the sandy plains of north Mexico, but none of the horizontal layers is rich in ores, which are found chiefly in metamorphic rocks of Durango, Chihuahua, and the south.

Mexico is one of the richest mining countries in the world. It produces annually about 6 per cent of the world's output of gold, 30 per cent of silver, 5 per cent of copper, and 12 per cent of lead. Excepting Sinaloa and Sonora, which contain vast stores of the precious metals, nearly all the historic mines lie on the south-central plateau at elevations of from 5500 to 9500 feet. Silver is found in all the states, but the principal mines are in Sonora, Chihuahua, Sinaloa, Zacatecas, San Luis Potosí, Guanajuato, Hidalgo, and Mexico. A line drawn from Guadalupe y Calvo, Chihuahua, through Guanajuato and Mexico City, to Oaxaca will intersect perhaps the richest silver-yielding zone of the world. The central group of mines in the districts of Guanajuato, Zacatecas, and Catorce in the states of Guanajuato, Zacatecas, and San Luis Potosí have thus far yielded over half of the silver mined in Mexico. The Veta Madre lode of Guanajuato alone produced $252,000,000 between 1556 and 1803. Eighteen states of Mexico have gold-bearing districts; the metal, however, is found chiefly on the slopes facing the Pacific. Owing to the greater difficulty and expense in mining and reducing gold, it was formerly only produced when found in connection with silver ores. More recently gold-bearing quartz lodes have been worked. The rise of the gold production has been rapid during the last 20 years. In 1893 its value was less than 4 per cent of the silver output, in 1902 it was 20 per cent, and, in 1912–13, 48 per cent. Copper in a pure state is found near the city of Guanajuato and associated with gold in several states. Iron is in vast abundance in Michoacan, Jalisco, and Durango, but until the coal fields found at various points are developed there is little prospect that iron mining will become very important. The famous Cerro de Mercado, just outside the city of Durango, which was discovered in 1562, is a hill about 400 feet high, 1½ miles long, and ⅓ to ½ mile wide, consisting of a solid mass of iron ore 65 to 75 per cent pure iron. Mining experts have estimated the amount of ore above the surface at 500,000,000 tons, while no one knows how much may exist below the plain. Fuel is one of the most pressing needs of Mexico. Firewood costs in the city of Mexico $14 a cord. Coal ranges from $16 to $22 a ton and is brought from England and the United States. The difficulty is that most of the coal is remote from lines of transportation, and the fields cannot be developed till means of cheap carriage are provided. Sonora has a carboniferous area with veins from 5 to 16 feet in thickness of hard clean anthracite carrying as high a percentage of fixed carbon as the best coal of Wales. When it can be transported the anthracite of this field will supply the Pacific coast of North America with anthracite of the first quality for years to come. The coal deposits of Michoacan and Oaxaca are also undeveloped. Many of the inhabitants of the northern state of Coahuila burn mesquite bush, straw, and cotton bushes because they cannot procure the coal mined at Salinas in their state, which now supplies fuel for the International Railroad Company, a part of the Southern Pacific Railroad, and the factories in Monterey. Much lead is associated with silver, and tin, sulphur, salt, marble, and the building stones are in abundance. All other mining enterprises, however, are dwarfed by the colossal development of silver production. Most of the mines yield silver either alone or in combination with other ores. The mining industry, as well as all others, was seriously affected during the revolutionary movements from 1910 onward. In 1912–13 the silver production amounted, in Mexican silver, to $81,481,102 (in 1911–12, $88,839,747; in 1877–78, $24,837,000), and the gold production, $39,591,686 (in 1911–12, $49,905,115; in 1877–78, $747,000). In 1913 the production of copper was 116,402,880 pounds. The production of the other principal metals, in 1907, was as follows, in metric tons: Lead, 70,241,558; antimony, 3,070,230; iron, 1,363,-

290; coal, 1,024,579; mercury, 25,887. In 1907 the total number of mines of all kinds was 7296, of which 1032 were in operation, employing 95,991 men, 524 women, and 3130 children. In 1914 it was estimated that the foreign and Mexican capital invested in the mining industry amounted to $647,000,000.

One mint and ten government assay offices are maintained. The total coinage of Mexican silver from 1537 (when the city of Mexico mint was founded) to 1905 amounted to $3,546,393,617—more than one-third of the world's production of silver since 1493. As a large amount of silver is not coined, but is used in the arts, it is estimated that Mexico has produced nearly one-half of the world's silver mined in the past four centuries. From April 16, 1905, the mints and assay offices have ceased to accept bullion from private persons for free coinage. Most of the gold and silver is exported, the bulk going to the United States.

Petroleum. The presence of deposits of oil and asphalt was always recognized, but it is only within the past few years that this industry has been developed. Oil is found throughout the Gulf coastal plain, from Tamaulipas to Campeche; the principal centres of production are the Tampico region and the Isthmus of Tehuantepec. Most of the oils are heavy and are more especially adapted for use as fuel, although many contain valuable refining products. Many companies have been formed for exploiting the oil fields, refineries and pipe lines have been established, and in the Tampico district alone about 5,000,000 acres are held for oil purposes. The chief oil ports are Tampico, Tuxpam, and Puerto Mexico. The following table from the *Mexican Year Book* of 1914 shows the remarkable growth of the petroleum production in Mexico:

YEAR	Barrels	Percentage of world's production
1900–06	1,000,000	...
1907	1,000,000	0.38
1908	3,481,410	1.22
1909	2,488,742	0.84
1910	4,531,826	1.38
1911	14,051,693	3.70
1912	16,558,215	4.71
1913 (estimated)	26,000,000	...

Flora and Agricultural Resources. The sharp differences in climate produce rapid transitions in forms of vegetation; in a few hours' travel great differences not only in the kinds of plants but also in the stages of growth of the same plant are observed. The Mexican Southern Railroad from Puebla to Oaxaca descends by fertile terraces from 7000 feet to 1750 feet above the sea. In March the green wheat is just peering above the ground in Puebla, while lower down along this railroad fields of wheat are ripe for harvest and still lower the grain is being threshed. The varied conditions of temperature and moisture result in the greatest contrasts, desert areas lying contiguous to grassy steppes, which are succeeded by cultivated fields, and in the lowlands by forests with an inextricable tangle of tropical undergrowths. Gray, thorny plants characterize the northern region, where rain seldom falls, though even this region is brightened in the spring by many flowers. Owing to the undeveloped state of coal mining and the great need of fuel and timber for the mines, the forests that once covered the mountains have been largely destroyed, and thus the conditions of rainfall have been considerably modified. But many varieties of oak and also pines and firs are found on the mountain slopes; and the hot lands have about 100 varieties of building and cabinet woods, including mahogany and rosewood, besides dyewoods, gum trees, the fig, and oil-bearing trees and plants, such as the olive, coco palm, sesame, and almond. Fifty-nine species of medicinal plants have been classified.

Few countries equal Mexico in the variety of its economic vegetable products. Coffee is extensively cultivated in the temperate lands of Vera Cruz, Oaxaca, Chiapas, Morelos, Jalisco, and Tepic. It is of an excellent quality and about 40,000,000 pounds are exported annually. About 90 per cent of the cotton is grown upon the irrigated lands in the "laguna district" of the states of Coahuila and Durango, and the remainder is produced in the districts of Tuxpam and Vera Cruz and along the Pacific coast. The entire production of the staple yields about one-half the amount needed for the Mexican mills. Sugar cane is extensively cultivated in the lowlands of the southern states, but as yet the amount produced is insufficient to supply the home market. Tobacco is grown all over the Republic and that produced on the warm lands south of Tampico and San Blas is almost equal to Cuban leaf in aroma. Its improved cultivation was introduced by Cuban planters about 40 years ago. Maize, the chief crop throughout the temperate region, thrives best south of Durango. Another great food staple is the frijol, or brown bean, cultivated with peas and lentils and daily eaten by most Mexicans. The wheat crop in the cold zone is worth only about one-fourth as much as the maize crop.

A great variety of tropical fruits are raised in the hot zones, including oranges (up to 2500 feet), lemons, bananas (up to 5000 feet), easy to cultivate and affording a large profit, pineapples (from sea level to 3000 feet), and coconuts along the hot coasts. Many species of the agave grow on the central plateau. One of them, the maguey, yields large quantities of a white juice which, when fermented, produces the intoxicating liquor called pulque, the national beverage of Mexico. Other species of the agave yield henequen, or sisal hemp, whose cultivation and preparation for market are by far the most important of the fibre industries and have made the prosperity of the State of Yucatan, in the northern part of which it is produced. Enormous quantities are exported to the United States for sacking, cordage, and binder twine. The *Castilloa elastica* is the predominant species of rubber tree, and, though rubber collecting is as yet little developed, it is destined to be very profitable. The cacao tree thrives chiefly in Chiapas and Tabasco, but not enough cocoa is produced for home consumption. The vanilla bean grows luxuriantly on the Gulf coast and brings a high price on account of its excellent quality. Rice on the coasts is usually grown without irrigation, depending entirely upon the rainfall. The soils of Mexico excepting in the sandy north and some areas of sand along the coasts are excellent. The agricultural resources are capable of far larger development as soon as irrigation is applied to the naturally productive lands. Much of the plateau is semiarid, but the neighboring mountains have inexhaustible supplies of water, which by the construction

of reservoirs and other modern appliances may be conserved for agricultural uses. Farming methods are crude and modern machinery has been introduced only on the large plantations. The chief agricultural products of 1907 were (a kilogram = 2.2 pounds; a hectoliter = 2.8375 bushels):

	Kilograms		Kilograms
Sugar cane	2,762,089,370	Chile seco	13,312,964
Wheat	312,109,551	Cacao	3,108,960
Henequen	113,089,629	Oats	406,925
Ixtle	62,767,916		Hectoliters
Coffee	50,113,450		
Cotton	33,631,842	Corn	72,501,217
Rice	32,885,335	Barley	3,819,876
Sweet potatoes	27,277,367	Frijoles	2,113,472
Tobacco	19,445,564		

Fauna. In the plateau regions the fauna is that of the North American continent, while it is more closely associated with that of the West Indies in the coast lands of the gulf; that of the Pacific seaboard partakes of the character of the California and South American fauna. Wolves and coyotes are common in the northern states, and bears, peccary, the puma, jaguar, and ocelot are found among the mountain forests. In the tropical forests are five varieties of monkeys and a species of sloth. Among the other animals are the hare, rabbit, squirrel, beaver, mole, marten, otter, and several species of deer. A few boas in the south and several other species of snakes, some of them very venomous, as the rattle and coral snakes, represent the ophidians. Noxious insects infest the hot regions in myriads. The coast waters and estuaries of the rivers teem with fish, and turtle shell is an article of some trade importance. Bees are numerous and their wax is exported. Vultures are the scavengers of every town, and parrots, humming birds, and other tropical birds vie in brilliancy of plumage with those of Brazil. The Mexican mocking bird and other songsters are unsurpassed. Only the turkey and a species of duck have been domesticated, all the farm animals having been introduced by the Spaniards into Mexico, where they have multiplied prodigiously.

Animal Industries. Stock raising is one of the leading industries. In the low-lying coast regions, particularly in Vera Cruz and Tabasco, are moist savannas, covered with nutritious grasses, where cattle may be reared and fattened at small expense; and on the comparatively arid plateau of the north there is sufficient herbage to support enormous numbers of cattle. On some of the haciendas 10,000 to 30,000 head are in charge of vaqueros, who are very skillful in throwing the lasso and in all the other arts of the cowboy. Mexican cattle are of inferior quality (long-horned type) and small size, weighing only 900 to 1000 pounds. Stock raisers have begun to improve their herds by the importation of better breeds from the United States. Hides are an important export to the United States, and hundreds of thousands of undeveloped steers are sold in Texas. The horses are small but hardy animals. Sheep produce only 1 to 2½ pounds of coarse and inferior wool to the fleece, all of which is consumed in the home mills, which import much wool of finer grades, while well-to-do Mexicans wear imported clothes. The tendency towards the improvement of all the native domestic animals and of the methods of stock raising has given rise to a large expansion in these industries.

Manufactures. The manufacturing industries have progressed slowly, though with the advent of much foreign capital during the long period of peace under the Díaz régime there was a large development of many industries. The first cotton mill was erected in 1834. In 1911–12 there were 148 cotton spinning and weaving mills (126 in operation) with 762,149 spindles, 27,019 looms, and 50 printing machines, consuming 33,153,636 kilograms of cotton, producing 14,128,366 pieces of cloth (27 meters long) and 3,020,569 kilograms of yarn, and employing 32,209 hands. There were 44 factories in Puebla, 14 in Vera Cruz, 12 in the federal district, 10 in Coahuila, and from 1 to 8 in 18 other states. The 440 tobacco factories used 10,137,789 kilograms of tobacco and produced 570,352,851 packages of cigarettes, 42,461,139 cigars, 36,818,213 cheroots, besides pipe tobacco and snuff. The largest number of factories were in Guanajuato (62), Vera Cruz (55), Michoacan (45), Tamaulipas (34), Jalisco (28), and San Luis Potosí (25). In 1907 over 2000 establishments engaged in the manufacture of sugar products produced 116,774,165 kilograms of sugar, 96,238,319 kilograms of molasses, and 84,241,728 kilograms of panocha. The distilleries manufactured 1,769,397 hectoliters (1 hectoliter = 26.417 gallons) of rum and 4,629,818 hectoliters of pulque. The other important industries are woolen and linen spinning and weaving, the manufacture of glass, drugs, chocolate, paper, guayule, matches, soap, brick and tile, porcelain, flour, iron and steel, candles, furniture, and beer brewing. The artisans of the plateau are skilled in making the broad-brimmed Mexican hats, silver ornaments, jewelry, saddlery, leather work, and embroidery, and in other arts that contribute to the distinctive finery of Mexican attire and equipment. The feather work and other products of the Indians are still highly prized. The government encourages the development of home industries by imposing a tariff amounting on an average to about 38 per cent on the declared value of nearly all imported goods.

Commerce. The value of the foreign trade of Mexico has for years been rapidly increasing. The exports have steadily increased and have been larger than the imports, which have fluctuated considerably since 1907. The following table shows the value, in Mexican silver dollars or pesos (the peso = $0.46 United States currency), for the several fiscal years:

YEAR	Imports	Exports
1894–95	$66,200,000	$95,000,000
1899–1900	128,700,000	158,200,000
1904–05	178,204,962	208,520,451
1909–10	194,866,000	260,046,000
1912–13	195,772,000	300,405,000

The trade with the leading countries and the percentages of the total trade were as shown on page 540 for the several fiscal years.

The leading articles of export in 1912–13 were valued (in pesos) as follows: Silver, 91,293,652; gold, 39,591,427; copper, 36,522,115; henequen, 30,133,754; dry hides, 11,170,432; coffee, 11,263,700; rubber, 8,376,350; cattle, 7,555,585; guayule, 7,234,576; chick peas, 4,930,361; lead, 4,907,334; textiles, 3,646,441; woods, 3,365,131; and vanilla, 3,315,471.

IMPORTS FROM	Amount in millions of pesos			Percentage of total trade		
	1904–05	1909–10	1912–13	1904–05	1909–10	1912–13
United States	99.97	112.84	97.28	56.66	57.90	49.69
Great Britain	21.64	22.25	25.90	12.13	11.41	13.22
Germany	20.45	20.26	25.22	11.47	10.41	12.89
France	17.71	17.43	18.33	9.94	8.94	9.37
Spain	7.73	5.28	10.53	4.34	2.71	5.38
Other countries	10.67	16.78	18.49	5.26	8.63	9.45

EXPORTS TO	Amount in millions of pesos			Percentage of total trade		
	1904–05	1909–10	1912–13	1904–05	1909–10	1912–13
United States	152.93	196.97	232.03	73.34	75.74	77.24
Great Britain	17.08	28.53	31.14	8.19	10.97	10.37
Germany	16.17	8.44	16.43	7.75	3.24	5.47
France	5.92	12.28	7.15	2.84	4.72	2.38
Spain	1.93	1.93	2.18	0.92	0.74	0.73
Other countries	14.45	11.88	11.45	9.96	4.59	3.81

The principal classifications of imports and exports were valued as in the tables below.

Shipping and Communications. Most of the foreign trade of Mexico is carried either by railroad or in foreign bottoms. The mercantile marine of the country comprised, in 1911, 32 steamers of 16,648 net tons and 52 sailing vessels of 8712 net tons. In 1911–12 over 9000 vessels engaged in foreign and coastal trade entered the Mexican ports. The table on page 541 shows the increase in the number of vessels and tonnage.

IMPORTS	1904–05	1909–10	1912–13
	Pesos	Pesos	Pesos
Mineral substances	52,758,614	27,929,814	46,711,978
Vegetable substances	30,426,903	21,355,726	31,285,563
Machinery and apparatus	22,442,984	10,470,848	23,383,811
Textiles	23,282,549	10,110,462	21,281,571
Animal substances	.....	7,506,442	16,466,311

EXPORTS	1904–05	1909–10	1912–13
	Pesos	Pesos	Pesos
Mineral products	130,303,978	78,260,037	189,648,610
Vegetable products	59,076,270	38,857,899	85,942,954
Animal products	10,505,119	10,052,092	19,837,832
Manufactured products	7,896,959	1,768,326	3,345,264

In 1911–12, 1107 steam and 6 sailing vessels visited more than one port, bringing the total tonnage of vessels entering up to 7,256,210 and of those departing to 6,611,921. In this same year 4169 steam and 2982 sailing vessels, most of them very small and owned by Mexicans, which were engaged in coastwise trade, entered the various ports of the Republic.

The first railroad, only 3 miles in length, connecting the city of Mexico with Guadalupe, was completed in 1854. Since 1870 railroad construction has been carried on rapidly. The railroad between Vera Cruz and the city of Mexico was completed in 1873. Mexico is now covered with a network of railways, which reach all the important cities and mining districts. In 1910 the railway mileage was 15,260 (1914, about 16,000), of which 8612 miles were under the control of the National Railways of Mexico, a corporation in which the government owns a controlling interest by holding 50.3 per cent of the shares. The National Railways System, formed in 1909 by the consolidation of various lines, extends from the United States border, at two points, to Guatemala and from the gulf to the Pacific in two places. Of this system, the National Railroad (1218 miles) begins at Laredo and traverses the eastern portion of the central plateau to Mexico City, with a branch to Matamoros; the Mexican Central (3516 miles), starting from Ciudad Juárez, runs across the central uplands to the capital and beyond to the Balsas River, with numerous branches, one to Tampico on the gulf and one to Manzanillo on the Pacific; and the International Railway (917 miles) from Piedras Negras (Ciudad Porfirio Díaz) crosses the states of Coahuila and Durango. South and east of the capital the National Railway controls the Interoceanic Railway (736 miles), Mexico City to Vera Cruz; the Vera Cruz and Isthmus line (264 miles), from Vera Cruz to the Tehuantepec line; the Tehuantepec Railroad (220 miles), from Puerto México (Coatzacoalos) on the gulf to Salina Cruz on the Pacific; and the Pan-American Railway (297 miles), from San Gerónimo on the Tehuantepec line to the Guatemalan border. The principal independent lines are the Mexican Railway (520 miles), from Mexico City to Vera Cruz; the Kansas City, Mexico, and Orient (276

miles), building across central Chihuahua; the Mexico Northwestern (472 miles), from Ciudad Juárez through western Chihuahua; the Southern Pacific (1195) from Nogales southward along the Gulf of California and the Pacific to Mazatlan and Tepic; and the United Railways of Yucatan (503 miles). Most of the railroads of Mexico have been constructed with foreign capital, together with liberal government subsidies, under concessions providing for the ultimate reversion to the government, and are operated according to the Mexican Railway laws, under the supervision of the Railway Commission.

YEARS	ENTERING				YEARS	DEPARTING			
	Steam		Sailing			Steam		Sailing	
	Number	Net tonnage	Number	Net tonnage		Number	Net tonnage	Number	Net tonnage
1900–01....	906	2,256,220	553	191,589	1901–01...	883	2,216,546	540	194,100
1905–06....	1694	2,879,626	426	172,248	1905–06...	1016	2,627,111	408	164,074
1911–12....	1407	3,434,293	683	170,234	1911–12...	1418	3,521,544	641	183,198

In 1912 the federal government, which has a monopoly of the commercial telegraph business, had in operation 530 telegraph offices, 25 telephone stations, and 8 wireless telegraph (Telefunken system) stations. It had 46,037 miles of telegraph wires and transmitted 4,531,683 messages, which produced a revenue of 2,357,000 pesos. The railways also have telegraph lines for handling their own business. In 1912 there were 2911 post offices (1972 in 1900), which handled 101,920,217 letters, post cards, and packets. The postal revenue was 4,700,297 pesos in 1912–13. Mexico is a member of the Universal Postal Union, has both national and international money-order systems, and has parcel-post conventions with a number of countries.

Banking. The present banking system of Mexico dates from 1897. The law of that year provided for three classes of banks, viz.: banks of issue, issuing notes payable to bearer on demand; banks for mortgage loans, issuing mortgage bonds to cover loans on real estate; and banks of encouragement, issuing treasury bonds to cover loans to industry and agriculture. By the new law the National Bank of Mexico, which with the Bank of London and Mexico and the International and Mortgage Bank had been established previous to the passage of the law and enjoyed a monopoly of the issuance of bank notes, was restricted and the establishment of other banks of issue was permitted in the states under conditions practically limiting the number to one in each state. The purpose of the law was to extend banking privileges to all parts of the Republic, but the granting of charters was surrounded by careful restrictions. A bank of issue could not be founded with less than 500,000 pesos capital (increased to 1,000,000 pesos in 1908); no bank could be organized till the capital was fully subscribed and 50 per cent paid in; bonds equal to 20 per cent of the capital were to be deposited with the government or the National Bank; and the duration of the charter was not to exceed 30 years. Numerous special privileges, mostly in the form of exemptions from taxation, were conferred upon the banks chartered under the Law of 1897. Banks multiplied so rapidly after this date that in 1905 it was decided, in order to check further extension, that no further charter for a bank of issue should be granted until after Dec. 31, 1909. Subsequently this time limit was extended to March 19, 1922, the date of the expiration of the first charters granted under the law, which is tantamount to the concession of a monopoly to the now existing banks. All banks are under the direct supervision of the government and are obliged to publish detailed monthly statements of their condition.

In 1897 there were altogether 10 banks, with a capital of 41,500,000 pesos, cash holdings of 43,915,000, and reserve funds of 2,983,000. At the close of the fiscal year 1912–13 there were 33 chartered banks, with a capital (stated in pesos) of 164,600,000, cash holdings of 86,517,284, reserve funds of 37,140,595, and note circulation of 130,228,259. The capital of the National Bank is 32,000,000; of the Mexican Central Bank, 30,000,000; of the Bank of London and Mexico, 21,500,000; of the International and Mortgage Bank, 5,000,000; and of the other banks from 10,000,000 to 200,000. After the above date banking conditions were seriously disturbed by the revolution. The banking system in 1915 comprised 25 banks of issue, including the National Bank (founded in 1882), the fiscal agent of the government, with its 60 branches, the Bank of London and Mexico (established in 1864), and 23 state banks, two mortgage banks, and six banks of encouragement, one of which, the Mexican Central, organized in 1898 at Mexico City, serves as a clearing house. There are also a number of independent banks in the capital. Banking in Mexico is very profitable and the existing banks are in a flourishing condition. During the decade ending 1912 the National Bank paid annual dividends ranging from 15 to 20 per cent and the Bank of London and Mexico from 12 to 14 per cent. In 1912 the reports of 27 banks paying dividends showed an average of 7.1 per cent.

Finance. Mexico still needs capital to develop her resources and give employment to labor. A great deal of foreign capital is invested in the country, but much more will be required before the natural resources are adequately developed. Upon the achievement of independence it was seen that the colonial financial system was inadequate and unadaptable to the new Republic, and the inexperienced government had to improvise and try new methods, with the result that the finances fell into a chaotic state. Lack of railways and other internal developments and continually disturbed political conditions served to continue this state and caused Mexico's credit to fall very low in the money markets of the world. On account of her finan-

cial difficulties and under pretext of protecting the interests of European bondholders, France, England, and Spain intervened in Mexico with an armed force in 1861. After the withdrawal of England and Spain, the Emperor Napoleon III proceeded to carry out his plan, formed beforehand, of setting up an empire under Maximilian in 1864. It was not till peace and order were established, after 1877, that Mexico's credit began to revive and that the revenues finally reached an amount sufficient to pay the public expenses.

At the close of the fiscal year June 30, 1896, Mexico was able for the first time since achieving independence to show a surplus of $6,000,000. The obnoxious tax called *alcabalas*, or interstate duties on domestic and foreign commerce, was a great drawback to internal trade and was finally abolished on July 1, 1896. The country was then in such a condition that radical financial and other reforms might be introduced without danger of serious disturbances.

The per capita expenses are necessarily large, as the population is small in proportion to the vast extent of coast line and the large area requiring army, revenue, lighthouse, and police services; and only a small part of the inhabitants are wealth producers, the burden of taxation falling chiefly upon a fourth or a third of the people. It is only since 1888 that the reorganization of the federal treasury has enabled that office to keep correct and complete accounts of the public expenses. The following is a statement of the national receipts and expenditures, in Mexican silver pesos, for several fiscal years:

FISCAL YEARS	Revenues	Expenditures
	Pesos	Pesos
1891–92	64,653,630	64,624,084
1900–01	62,998,805	59,423,006
1904–05	132,997,000	109,132,000
1908–09	98,775,510	92,967,393
1910–11	111,142,401	100,913,923
1912–13	120,958,902	110,781,871

A large portion of the annual surpluses has been expended on public improvements, with a view to developing the country. Financial conditions were considerably disturbed, on account of the revolutionary movements, from 1910 to 1915. The budget for 1914–15 estimated the expenditures at 152,204,898 pesos.

The federal revenue is derived chiefly from the import and export duties, the stamp tax, the direct taxes payable in the federal district and the territories, the federal contribution (a surcharge of 20 per cent on all state taxes), excises on gold and silver, tobacco, alcoholic beverages, cotton yarn and textiles, and petroleum, and the earnings of the posts and telegraphs. The duties levied on foreign trade are highly protective and yielded in 1912–13 about 41 per cent of the revenue. Export duties are levied upon some of the largest exports, such as henequen, cabinet and dye woods, and vanilla. In 1912–13 the internal taxes collected through the use of stamps supplied about 24 per cent of the receipts, and the direct taxes levied upon the real estate, scientific professions, and industrial establishments of the federal district, together with other items, made up the remainder. Taxes on the professions vary from 50 cents to $20 a month. In the above year about 33 per cent of the revenues was expended by the Department of Finance and Public Credit, 25 per cent by that of War and Marine, 6 per cent by that of Public Instruction, and lesser amounts by the other departments. On June 30, 1913, the public obligations comprised a foreign debt of 310,105,945 pesos and an internal debt of 134,197,810 pesos.

The revenues of the Mexican states, derived chiefly from taxes on real estate, amounted in pesos in 1907 to 29,002,497, varying from 264,855 in Colima to 3,504,391 in Yucatan. The municipalities had an income of 19,073,620 in this same year.

Population. Mexico consists of 27 states, 3 territories, and the federal district, and had a population of 15,112,608, or 19.7 per square mile, in 1910; 1920, 15,115,612. It is difficult to take a correct census because many people, especially the Indians, fear that they will be taxed if they are enrolled in the census returns. The table on page 543, compiled from the *Mexican Year Book* for 1914, gives the names of the states and territories, named in order from north to south in each group, area, population, density of population as given in 1910, the capitals and their populations.

About 19 per cent of the population are pure white, 43 per cent mixed bloods, and 38 per cent Indians. The cold lands, being the most healthful, have the densest population, about 75 per cent of the total population; a relatively small part of the people, from 15 to 18 per cent, live in the temperate zone, and only 7 to 10 per cent in the torrid zone. The first census in 1795 showed a population of 5,200,000. Thus in a little over a century the population has nearly trebled. The increase of the Indian population is comparatively slow because, though the Indians have large families, they are subject to many epidemics. The foreign population numbers over 100,000, Americans, Spaniards, English, and Germans being the most numerous. Many branches of business are monopolized by the English, Germans, and French. The country is to some extent being Americanized as far as means of transportation, electric lighting, improved hotels, and other modern conveniences are concerned. The tendency of the people, however, is to cling to the old habits which grew out of their Spanish ancestry and climatic environment. They still desire their midday siesta, their religious feast days and holidays, but they are unwilling to live abstemiously, spending their money freely and dressing poorly. This is especially true of the Indians.

Immigration and Public Lands. Immigration has been left largely to itself, the government having made little official effort to encourage it, other than to enact laws providing favorable conditions for immigrants. With respect to colonies more has been done. Numerous French, Italian, German, Mormon, and Boer colonies have been formed, under special privileges from the government, and on the whole have done well. The new Immigration and Colonization Law of March 1, 1909, provided for the exclusion and deportation of undesirable persons, including those likely to become public charges, fugitives from justice, except for political offenses, and anarchists. Special regulations were also made for the admission of immigrant laborers and the supervision of transportation lines carrying them, with a view to preventing the entry of those who are physically

unsound. The movement of passengers at the sea and land ports of the Republic in 1907 gave a net increase to the population of 13,394, most of whom were from the United States. The low rate of wages, the fact that a large portion of the public lands is already disposed of, the lack of adequate surveys, the inability to secure lands in small tracts, and the unwillingness of the large landholders to divide their estates are the obstacles to a large immigration. The Land Law (March 26, 1894) divided the public lands into four classes, provided regulations for the denouncement and acquisition by Mexicans and for the lease by others, and exempted from alienation the seashore, banks of navigable rivers, and lands having monumental ruins. Under this law 3,553,732 hectares were granted by the government from 1901 to 1907. Owing to vagueness and inaccuracy of the data which the government possessed regarding public lands, the law was suspended by Congress in 1909. The surveying of public lands was placed under the direction of the Agrarian Commission at this date. The land question was one of the important factors in the revolutionary movements following the downfall of Díaz.

STATES AND TERRITORIES	Area in square miles	Population 1895	Population 1900	Population 1910	Density per sq. mile	Capital	Population
ATLANTIC STATES							
Tamaulipas	30,826	203,342	218,948	249,641	8.10	Victoria	12,103
Vera Cruz	27,875	853,892	981,030	1,124,368	40.32	Jalapa	24,816
Tabasco	10,372	133,926	159,834	187,574	18.07	San Juan Bautista	12,327
Campeche	18,086	87,264	86,542	86,661	4.79	Campeche	16,775
Yucatan	15,937	*297,088	*309,652	339,613	21.31	Merida	62,447
Quintana Roo (territory)	19,267			9,109	0.46	Santa Cruz de Bravo	2,000
Total	122,363	1,575,512	1,756,006	1,996,966			
INLAND STATES							
Chihuahua	90,021	260,008	327,784	405,707	4.50	Chihuahua	39,709
Coahuila	63,775	237,815	296,938	362,092	5.67	Saltillo	35,414
Nuevo León	25,027	307,856	327,937	356,150	14.58	Monterey	18,528
Durango	42,265	292,549	370,294	483,175	11.43	Durango	31,763
Zacatecas	24,467	447,265	462,190	447,556	19.50	Zacatecas	25,900
San Luis Potosí	24,000	562,195	575,432	627,800	26.15	San Luis Potosí	68,022
Aguascalientes	2,969	102,378	102,416	120,511	40.58	Aguascalientes	45,198
Guanajuato	10,948	1,047,817	1,061,724	1,081,651	90.65	Guanajuato	35,682
Querétaro	4,492	224,848	322,389	244,663	12.95	Querétaro	33,062
Hidalgo	8,635	552,817	605,051	646,551	75.38	Pachuca	39,009
Mexico	9,228	837,981	934,463	989,510	110.58	Toluca	31,247
Federal district	578	468,705	541,516	720,753	1245.32	Mexico City	471,066
Morelos	1,896	156,786	160,115	179,594	65.68	Cuernavaca	12,776
Tlaxcala	1,534	163,244	172,315	184,171	120.04	Tlaxcala	2,812
Puebla	12,990	973,876	1,021,133	1,101,600	84.77	Puebla	96,121
Total	322,825	6,635,140	7,191,697	7,951,484			
PACIFIC STATES							
Lower California (territory)	58,328	41,838	47,624	52,272	0.80	Ensenada (No. dist.)	2,170
						La Paz (So. dist.)	5,536
Sonora	76,619	189,158	221,682	265,383	3.47	Hermosillo	14,578
Sinaloa	27,553	256,858	296,701	323,642	11.73	Culiacan	13,527
Tepic (territory)	10,951	146,805	150,098	171,173	15.61	Tepic	16,778
Jalisco	33,486	1,094,569	1,153,891	1,208,855	36.09	Guadalajara	119,468
Colima	2,272	55,264	65,115	77,704	34.28	Colima	25,148
Michoacan	22,617	887,008	935,808	991,880	43.40	Morelia	40,042
Guerrero	25,275	417,886	479,205	594,278	23.76	Chilpancingo	7,994
Oaxaca	35,683	872,902	948,633	1,040,398	29.13	Oaxaca	33,011
Chiapas	27,523	318,730	360,799	438,843	15.92	Tuxtla Gutierrez	10,239
Total	320,307	4,281,018	4,659,556	5,164,158			
Islands	1,560						
Grand total	767,055	12,491,670	13,607,259	15,112,608			

* Includes Quintana Roo.

Education. In all the states education is free and compulsory in the primary grades; illiteracy, however, is very prevalent, and little has been done to educate the Indians. The table opposite shows the status of the educational establishments of the Republic in 1907.

There were 18,617 supervisors and teachers in the primary and secondary schools. The professional schools include law, normal, agricultural, commercial, medical, fine arts, arts and trades, engineering, military, and naval schools. The Mexican University, founded in 1553 and dissolved in 1862, was reorganized in 1910 with the various faculties, and is now at the head of the educational system of the country. There were also, in 1907, 2561 private and clerical schools, with 174,880 pupils, giving all grades of instruction from primary to professional. The public and private libraries are notable, the largest of them, the National Library, containing 200,000 volumes; there are 186 other public libraries, 38 museums for scientific and educational purposes, 11 meteorological observatories, 56 scientific and literary societies, and 1571 periodical publications, including 53 in

	NUMBER OF SCHOOLS SUPPORTED BY		Number of pupils
	Federal and state governments	Municipalities	
Kindergarten	69	10	8,880
Primary	6,397	3,144	657,522
Secondary	42	....	5,782
Professional	74	....	9,984

English, 6 in Spanish and English, 3 in Spanish and Latin, 3 in French, and 1 in German. Mexico is one of the first countries of Latin America in artistic, literary, and scientific advancement.

Religion. One of the motives of Spanish colonization was the conversion of the natives to the Christian faith. Upon the site of the heathen temple of Tenochtitlan arose the cathedral of Mexico. The Franciscan Order was the first to begin work in Mexico (1524), and was soon followed by the Dominicans and other orders. In 1527 Fray Juan Zumarraga was made the first Bishop and in 1545 the archbishopric of Mexico was created. The Inquisition was established in 1571, but the Indians were exempt from its jurisdiction. The following years the Jesuits came. There were many able churchmen as well as many who were corrupt, and during the colonial régime the church wielded a powerful influence. It was occupied with the conversion of the natives and the care of the religious life of the Spaniards, and had charge of the schools, hospitals, and asylums of the viceroyalty. In 1767 the Jesuits were expelled from Mexico as well as from all the other Spanish American colonies. During the wars of the independence a number of priests, such as Hidalgo, Morelos, etc., were active leaders in the movement, and in the establishment of the Empire of Itúrbide the church played a large part. The Inquisition was abolished in 1820. Since the independence the church has sided with the conservative element and has always been an active factor in the disturbances which have torn the country. During the colonial times and after it amassed great wealth and in the middle of the nineteenth century was said to possess about one-third of the real and personal property of the Republic. These conditions created no little antagonism to the church and as a consequence the constitution of 1857 provided for freedom of religious opinion. Two years later, the Laws of the Reform, issued by Juárez, brought about the complete separation of the church and state and the confiscation and nationalization of the property of the church. Since that date the Roman Catholic church has continued to exercise much influence in the affairs of the nation, as the majority of the people are still under its teachings. Nevertheless a considerable portion of the Mexicans have drifted away from or become antagonistic to the Roman Catholic church. It had, however, in 1910, 3 archbishops, 18 bishops, over 9000 churches and chapels, and 12,664,182 adherents. The Protestants began work in Mexico in 1867 and now have churches in all parts of the Republic. In 1910 they had 294 foreign missionaries, 529 native workers, 563 stations and substations, 24,771 communicants, 92,156 adherents, 139 day schools with 7640 pupils, 30 higher institutions with 4108 pupils, and 8 hospitals and dispensaries.

Government. The present constitution of Mexico was adopted by a constituent assembly on Feb. 5, 1857, and has undergone various amendments extending down to the year 1908. It is a written instrument of great length and is closely modeled after the Constitution of the United States. The declaration of the "rights of man" is the most complete document of its kind. Its 29 articles include personal freedom, freedom of speech and of the press, right of assembly and petition, right of bearing arms, guaranty of the rights of accused persons on trial for the commission of crime, including fair and speedy trial and exemption from special tribunals, and immunity from the operation of retroactive laws, laws which impose excessive fines or inflict unusual punishments and which take private property without compensation. In case, however, of great public danger from insurrection or invasion the President of the Republic, in concurrence with the Council of Ministers and with the approval of Congress, may suspend these guaranties for a limited period.

The government of Mexico is a democratic, federal, representative republic, composed of 27 states, 3 territories, and a federal district. The constitution provides for a distribution of the powers of government among legislative, executive, and judicial branches. The legislative power is vested in a Congress consisting of a Chamber of Deputies and a Senate. The Chamber of Deputies is composed of members elected by indirect secret ballot for a term of two years on the basis of one Representative for every 40,000, or fraction over 20,000, of the population and by an electorate which consists practically of all male adults. The qualifications for a deputy are citizenship and the full enjoyment of all the rights incident thereto, the attainment of the twenty-fifth year, and residence in the state from which he is chosen. Ecclesiastics are disqualified. The Senate is composed of two Senators from each state and two from the federal district, chosen in the same manner as the Representatives and possessing the same qualifications, except that the Senators must have attained the thirtieth year of age. The terms of one-half the Senators expire every second year. Both Senators and Representatives receive annual salaries of $3000 (which cannot be renounced) and are privileged from arrest for opinions expressed in the discharge of their duties. Each House is the judge of the election and qualifications of its own members. Two ordinary sessions of Congress are held annually, beginning respectively in April and September. The two Houses enjoy substantial equality of powers in legislation, except that financial and revenue measures and bills for the recruiting of troops must be first discussed in the Chamber of Deputies. Legislative measures may be initiated by the President of the Republic, the state legislatures, and by individual Senators and Representatives. Bills vetoed by the President, but subsequently passed by an absolute majority of each House, become law in spite of the executive veto.

The powers of Congress are enumerated with great specification in the constitution. They include the admission of new states to the Union, the erection of new states within the limits of old states, legislation regarding the federal district and territories, the levying of taxes, the issuing of mining and commercial codes, the maintenance of the army and navy, the declaration of war, the enactment of laws in regard to citizenship, naturalization, colonization, emigration, immigration, and general health of the country, the coinage of money, the regulation of weights and measures, the granting of pardons, and the enactment of all laws necessary and proper to the execution of the enumerated powers. The exclusive powers of the Chamber of Deputies include the exercising of the powers prescribed by law regarding the election of the President and Vice President of the Republic,

the judges of the Supreme Court, and the Senators from the federal district, the consideration and decision upon resignation and leave of absence of the President and Vice President, and the resignation of judges of the Supreme Court, supervision of the General Auditing Department, the approval of the annual estimates of expenses, and the impeachment of the President, secretaries of the departments, Senators, Representatives, judges of the Supreme Court, and governors of states for the commission of crimes during their terms of office. The exclusive powers of the Senate include the approval of treaties with foreign Powers, the ratification of nominations made by the President to important offices, the decision as to whether the status of a state government is such as to require the appointment of a provisional Governor, the decision of political conflicts within a state, and the trial of impeachments preferred by the House of Representatives. During the recess of Congress some of its important functions are discharged by a Permanent Deputation, composed of 15 Deputies and 14 Senators.

The executive power is vested in a President, or upon his default or absence on leave in a Vice President, who also is ex-officio President of the Senate. The President and Vice President are chosen indirectly by electors, who are themselves popularly elected, for a term of six years. Their qualifications are citizenship by birth, the full enjoyment of civil rights, the attainment of the thirty-fifth year, and residence in the country at the time of the election. In case of the default of both President and Vice President, either at the beginning or during the presidential term, the Secretary of Foreign Relations becomes the acting President and Congress calls for a new election, except when the default occurs during the last year of the presidential period. The office of President cannot be resigned except for grave cause, and then only with the approval of Congress. His chief powers are: to promulgate and execute the laws; to appoint and remove freely the Secretaries of State and all federal officials not otherwise provided for in the constitution or laws; to appoint with the approval of Congress ministers, diplomatic agents, consuls general, and the higher officials of the army, navy, and treasury; to declare war with the consent of Congress; to dispose of the army and naval forces; to grant letters of marque and reprisal; to negotiate treaties with foreign countries; to receive ambassadors and ministers; to call special sessions of Congress with the consent of the Permanent Deputation; to grant pardons; and to grant exclusive privileges to discoverers and inventors. In carrying out the work of administration the President acts through a cabinet composed of eight secretaries, who serve as heads of the departments of Foreign Relations, Interior, Justice, Public Instruction and Fine Arts, Promotion, Communication and Public Works, Finance, Public Credit and Commerce, and War and Marine. Every order, decree, or regulation of the President must be signed by one of the cabinet secretaries in order to be valid. The members of the cabinet do not occupy seats in Congress and their responsibility to that body extends only to criminal acts.

The judicial power of the Republic is vested in a Supreme Court and in district and circuit courts. At present the Supreme Court consists of 15 judges chosen by electors for a term of six years. They must be native-born citizens 35 years of age and learned in jurisprudence. They are required to take an oath to administer justice loyally and patriotically, and may resign only with the approval of Congress. The organization of the district and circuit courts is determined by statute. The jurisdiction of the federal courts extends to cases involving the application of federal law; to maritime cases; to cases in which the Republic is a party; to cases in which a state is a party; to cases arising under treaties with foreign Powers; and to cases concerning diplomatic agents. In those cases in which the Republic or a state is a party, and in those cases in which the question of jurisdiction arising between the state and federal courts is involved, the Supreme Court has original jurisdiction. In all other cases it has appellate jurisdiction.

The individual states of the Mexican Republic have a large degree of local autonomy, although the federal constitution requires that they shall adopt the popular, representative, republican form of government. They have their own constitutions and codes of laws, their own governors and unicameral legislatures, and local officials. They are allowed to regulate with one another their own boundaries subject to the approval of Congress. They may not form alliances or treaties with one another, grant letters of marque and reprisal, coin money or issue paper currency, tax the transit of persons or goods crossing their territory, lay duties on interstate commerce, or without the consent of Congress levy tonnage duties, keep troops or ships of war, or wage war except in case of invasion or peril so imminent as to admit of no delay. Each state is under an obligation to deliver without delay criminal refugees from other states and to give full faith and credit to the public acts, records, and judicial proceedings of every other state. It is made the duty of the state executives to publish the federal laws and cause them to be obeyed. On the other hand, it is made the constitutional duty of the federal government to protect the states against invasion or domestic insurrection upon request of the Legislature of the state concerned or of the executive if the Legislature be not in session. As in the United States, all powers not expressly conferred upon the federal authorities are reserved to the individual states. Similarly the federal constitution, the laws of Congress, and all treaties made in pursuance thereof are declared to be the supreme law of the whole Union, and the judges are bound thereby, anything in the constitutions or laws of the states to the contrary notwithstanding.

Amendments to the federal constitution may be proposed by Congress, two-thirds of all members present concurring. If approved by a majority of the state legislatures, they shall be a valid part of the constitution.

Money, Weights, and Measures. The currency law of 1905 placed Mexico on a practically gold basis. The theoretical unit is the gold peso, equal to $0.4984 United States currency. The silver peso has the same legal value as the gold peso and is of unlimited legal tender. The metric system of weights and measures was introduced in 1856 and was made compulsory in 1905. Before this latter date the old Spanish denominations were in current use.

Army. Since the resignation of General Porfirio Díaz as President, in May, 1911, the

country has been torn by revolution and counter-revolution, accompanied by a gradual disintegration of the federal army organized and maintained by him. The armed forces of opposing revolutionary leaders include individuals and units formerly belonging to the federal Mexican army. Notwithstanding these conditions, however, it may be assumed that the details of organization and conditions of service are, in the case of organized armed bodies, somewhat similar to those in existence under the régime of Díaz in 1911, as described below. *Higher Organization.*—In time of peace the regiment is the highest unit. Divisions are formed in war. General officers in peace: 7 generals of divisions, 41 generals of brigades, 55 brigadier generals. During the revolutions the number of generals enormously increases. *Infantry.*—All organization in Mexico is peculiar. The underlying principle is to arrange for the maximum expansion in war. The battalion has 4 companies. In peace the battalion is commanded by a colonel, with staff, which is expanded to a regiment by the addition of a battalion in war. In peace there were 34 battalions. Peace strength of company is 9 officers and 145 men. Total infantry, 1182 officers and 19,144 men. War strength of regiments, 47 officers and 1745 men. Total infantry strength in war, 3100 officers and 53,706 men. *Field Artillery.*—The artillery has 2 batteries to the battalion and 2 battalions to the regiment. There are in peace 1 regiment (4 batteries) of mountain artillery, 1 regiment (4 batteries) of horse artillery, 2 regiments (8 batteries) of light artillery, and in addition a so-called "squadron" of rapid-fire guns. Total peace batteries, 16, plus 1 skeleton mountain artillery regiment. Batteries have 6 guns, except horse batteries, which have 4. Peace strength of batteries varies between 6 officers and 79 men and 8 officers and 120 men, except the mountain batteries, which have 10 officers and 88 men. Total peace strength, 1912 officers and men. Upon mobilization the mountain artillery doubles, other regiments form 2 additional batteries. Total war strength, 3147 with 176 guns. *Cavalry.*—In peace 4 troops form a regiment at full peace strength, and 2 troops form a regiment at skeleton strength. Peace footing of troops, 6 officers and 72 men or 8 officers and 105 men. There are 14 regiments and 4 skeleton regiments. Total peace strength, 496 officers and 6822 men. In war each regiment is expanded to 6 troops. War strength of a troop, 5 officers and 140 men. *Coast Artillery.*—Unimportant detachments. *Technical Troops.*—War strength, 100 officers and 1000 men. *Train.*—Peace, 9 officers and 206 men; war strength, not known. *Sanitary Troops.*—No data. In addition to the regular troops there are 12 regiments of rurales, or military police, of 250 men each. Total peace strength, between 31,000 and 32,000. Total war strength, 100,000 officers and men. *Conditions of Service.*—In theory service is compulsory. Actually conscription is made to apply only to some of the lower and criminal classes. Upon mobilization conscription could be resorted to. *Arms.*—Infantry, the Mauser magazine rifle. Cavalry, Mauser carbine. Reserves, Remington rifle of 1893. Field and horse artillery use quick-fire guns of the Schneider-Canet system. Budget for 1910–11, 10,890,000 pesos.

Peoples of Mexico. The population of Mexico at the present day is largely Indian, and in many parts of the country ancient customs, superstitions, and languages hold sway. It is impossible to estimate the exact proportion of pure Indian blood, mestizo, or mixed blood, and white; probably there are about 5,000,000 pure-blooded Indians and a somewhat larger number of mestizos. Dr. León divided them into 17 families and 180 dialects, and was of the opinion that future studies would reduce this number of families to three mother tongues—the Otomí, Maya-Quiché, and the Nahua. Recent work has so far not justified this opinion. A number of stocks are totally extinct and little material is available for the study of them. In many parts of the Republic where certain languages are spoken over extended areas we find dialectal differences in every village. In some parts of Mexico the tribes occur in masses, while in other parts people speaking different languages are strangely intermingled. In the same town, separated by a single street, we may find two different languages spoken, while in one town Starr reports Aztecs, Otomí, Tepehuas, and Totonacs, each group keeping its independence in language, dress, customs, and beliefs, and occupying its own distinct quarter of the town.

Most of the Mexican Indians have been converted to Christianity; some are still idolaters, but have lost much of their knowledge of ancient traditions and religion. These are superstitious to a degree and believe in omens, witchcraft, and divination. Among the Huicholes, whose habits, customs, religion, and symbolism have been studied by Lumholtz, among the Mixes, who have been investigated by Starr and Belmar, and among the Lacandones, known through the field work of Tozzer, we find greater adherence to primitive ideas than among other Mexican peoples.

All over Mexico the commerce is carried on in very much the same manner as before the Spanish Conquest. Each town has its market place where a fair is held at regular intervals. The natives carry merchandise for long distances, to attend annual festivals of certain saints, whose modern shrines are built on the sites of ancient temples. The Indians are principally agriculturists, though certain aboriginal trades still prevail, such as weaving, basket and mat making, and the manufacture of pottery; and the products of these industries, for which certain villages are noted, are distributed throughout extended areas. Their mode of living, habitations, and clothing have changed but little under white influence. Their food consists mainly of corn, beans, and chili peppers; the corn is made into cakes, or tortillas, or a thin mush called posole; their food is prepared as before the Conquest, although to a certain extent cooking vessels of tin and iron are used as well as those of clay. Their great vice lies in the use of alcoholic stimulants; they make many native drinks as in former times, and on every possible occasion they indulge in their use.

History. The events of prehistoric Mexico are confused in a mass of myth. Legend carries the story of the Toltecs, the first historic race, back to the early centuries of the Christian era, when they began their migration, which finally led them, about the year 754, to the valley of Mexico. Here they founded the cities of Tulan and Tulantzinco, of which vast ruins still exist some 50 miles north and northeast of Mexico City. In the year 1064 the Toltec power was overthrown and they were eventually

driven from the country, going off towards the south, where they are supposed to have erected some at least of the immense buildings now in ruins in Yucatan, Honduras, and Guatemala. Their conquerors, the Chichimecas, first appeared in the vicinity of the two great volcanoes, Popocatepetl and Ixtaccihuatl, where the ruins of Amecameca show the centre of their power. After they succeeded the Toltecs as the dominant power, the Chichimecas settled at Texcoco, on the east side of the lake of that name, where they were living in a flourishing condition when, late in the twelfth century A.D., seven allied Nahuatlaca families or tribes entered the valley from the north, having started on their wanderings, quite possibly, in the cliff-dweller region of the modern New Mexico and Arizona. The Aztecs, the principal of these tribes, finally made a settlement at Tenochtitlan, on some marshy islets in Lake Texcoco, probably in the year 1325. It is said that this location was pointed out by a sign from the gods, an eagle perched upon a prickly-pear cactus, the nopal, strangling a serpent. This sign is now the national seal of Mexico. Tenochtitlan grew stronger, the islands were enlarged, and causeways were built to connect them with the mainland. By the time of the election of the first king or war chief, in 1376—the earliest authentic date in Mexican history—the Aztecs had won a position of influence in the valley. Huitzilihuitl, who was chosen chieftain or king in 1404, and his brother Chimalpopoca (1417–27), who succeeded him, greatly increased their power by intermarrying with the rival tribes and establishing trade relations, as well as by their successful battles. Itzcoatl (1427–40) (q.v.) rendered the dominant position of the tribe more secure by the formation of a confederacy with the Chichimecs and Tepanecs, for the purpose of conquering their outlying neighbors and forcing them to pay tribute. Montezuma I (1440–69) (q.v.) was perhaps the first chief to combine the war and priestly functions, and prepared for the downfall of the tribal power by allowing the latter to interfere with the former. His successors, Axayacatl, Tizoc, and Ahuizotl, considerably extended the influence of the tribe by conquering the tribes beyond the mountains, to the two seas on the east and west, and far towards the south, and forcing them to render tribute of slaves for the sacrifices which were becoming the established and popular religious practice of the Aztecs.

In 1502 Montezuma II was elected to the chief position in the tribe. (For an account of Montezuma's career and the invasion of Mexico by Cortés, see MONTEZUMA II; HERNANDO CORTÉS.) In November, 1519, Cortés entered Tenochtitlan—Mexico—and before the end of the month he had secured the person of the Mexican "Emperor," whose subjects soon fully realized that the white men would have to be expelled by force, and quickly commenced hostilities under the leadership of Montezuma's younger brother, Cuitlahuatzin (q.v.), and the Emperor's nephew, Guatemotzin (q.v.), or Cuahtemoc. On the *Noche Triste*, or "dreadful night," June 30, 1520, Cortés withdrew from the city of Mexico, and for a time his position was desperate, but the indomitable valor of the Spaniards enabled them to return to the attack. Cuitlahuatzin, Montezuma's successor, died in November, 1520, and was succeeded by Guatemotzin, whose heroic defense of the city of Mexico during the following year remains one of the noblest episodes in American history. Cortés began his siege of Mexico in May, 1521, and after the capture of Guatemotzin in August he set promptly to work at rebuilding the city. The dead bodies were burned and the city roughly cleansed, the canals filled up, streets, market places, and the sites for a church, fort, official residence, and other necessary buildings located. As an administrator Cortés was less successful than as a military leader, and the repeated complaints and threats against his rule led him to go to Spain to present his case at court. Military governors failed to control the affairs of New Spain, as Mexico was officially called, and the first Audiencia (1528) had no better success. The second Audiencia (1529) managed the government until 1535. In this latter year the Spanish colonial government reached its definitive form by the appointment of the first Viceroy of New Spain. The first incumbent, Antonio de Mendoza, "the good Viceroy," was intrusted with extensive powers and did much to advance the country and assure its permanent strength and welfare. Luís de Velasco succeeded to the viceroyalty in 1550, and during his administration the University of Mexico was founded (1553) and the mineral and other sources of wealth developed. Then followed a series of 61 viceroys who ruled the destinies of New Spain. Most of the viceroys were of noble family, some were able and wise, many were of the mediocre type of colonial officials, and not a few were corrupt and oppressive in their administration. On the whole New Spain enjoyed such prosperity as was possible under the monopolistic policy pursued by Spain in her colonial government. During the viceregal period the conversion of the natives was carried on, Indian revolts, which occurred from time to time, were suppressed, the exploration and settlement of New Mexico, Texas, and California were carried out, peaceful progress was made in agriculture and mining, commerce was developed as much as was possible under the restrictive system of Spain, conflicts of jurisdiction were settled, the disputes of the secular and ecclesiastical officials were adjusted, and the periodical inundations of the capital made necessary plans for draining the valley, which were formed by the Viceroy Velasco and completed by President Díaz at the opening of the twentieth century. In the eighteenth century many of the restrictions on trade were removed, the office of Intendant was established, and the second Count of Revilla Gigedo (1789) introduced many beneficent reforms in Mexico City. While carrying on these embellishments the ancient Mexican calendar stone and sacrificial block, which had been buried at the time of the Conquest, were discovered.

The gradual increase of education among all classes, the spread of liberal and revolutionary ideas, introduced from the United States, France, and England, the introduction of the liberal administrative reforms by Charles III, the chaotic conditions existing in Spain and the decline in the power of the home government, and finally the establishment of the supremacy of Napoleon in Spain, were the causes which contributed to the independence of Mexico. On Sept. 16, 1810, Miguel Hidalgo y Costilla (q.v.), the parish priest at Dolores, near Guanajuato, learning that the conspiracy in which he was

involved had been discovered, rang the church bell and called upon his people to follow him and free Mexico from foreign tyranny. His *Grito de Dolores*, the cry of "Long live religion! Long live our Holy Mother of Guadalupe! Long live America, and death to bad government!" marked the beginning of the struggle for Mexican independence. Hidalgo, after a series of successful fights with scattered Royalist forces, was defeated, driven north, and finally caught and shot at Chihuahua (July 30, 1811). His pupil, Morelos (q.v.), took up the leadership and became known as the "hero of a hundred battles." He assembled a congress at Chilpanzingo (Sept. 15, 1813), which abolished slavery and religious tithes, and issued a declaration of independence from Spain. Later he was defeated by the Royalist army under Augustín de Itúrbide (q.v.), betrayed by one of his followers, and shot in December, 1815. In 1817 Javier Mina invaded Mexico from Tamaulipas and maintained the fight for independence with the usual temporary success, until defeated, captured, and shot (November 11). Meanwhile Vicente Guerrero (q.v.) had gradually been establishing his claim to be the natural and most able leader of the Independents in the field, while among all classes in Mexico the feeling was growing more and more strong that the Spanish power must be done away with. Itúrbide determined to unite the two parties, and by the Plan of Iguala (Feb. 24, 1821) in which Guerrero and the Spanish Viceroy, Juan O'Donojú, joined, proposed an independent monarchy with a ruler from the Spanish royal family. The plan failed; no ruler could be secured from Europe, but independence had been practically and peacefully assured. Itúrbide arranged a popular demonstration, and the Congress ratified his choice of himself as Emperor (May 19, 1822). The older Independents soon refused to acknowledge his Empire, and on March 20, 1823, the opposition forced his resignation. An executive council of four revolutionary leaders, Nicolas Bravo, Guadalupe Victoria, Pedro Negrete, and Vicente Guerrero, managed affairs during the next year, calling for the election of a congress, which, on Oct. 4, 1824, proclaimed the first constitution of the Republic of Mexico. Guadalupe Victoria, the first President, gave the country a popular administration and a large measure of prosperity and was allowed to serve out his full term. In 1828 the election was bitterly contested by the Federalists or Liberals and the Centralists, aided by the Moderates and Conservatives. The Centralist candidate, Manuel Gómez Pedraza, was elected President, but a revolt under Antonio López de Santa Anna (q.v.) prevented his accession and his opponent, Vicente Guerrero, was installed in the presidency (April, 1829). Before the end of the year Guerrero was forced out and his Vice President, Anastasio Bustamante, was placed in control of the government.

Then followed a half century of internal disorder; revolution followed revolution; plans and pronunciamientos were issued by every political leader; Conservative and Liberal, Centralist and Federalist, Imperialist and Republican, carried on a seemingly endless struggle for power. For more than 20 years Santa Anna was the central figure in Mexican politics. At will he openly controlled the government as President or Dictator, or managed affairs while ostensibly in retirement. He sided with the Conservatives and Centralists and in 1843 dissolved Congress and assembled a Council of Notables, which formulated the Bases Organicas de 1843, a new reactionary conservative constitution. In 1836 Texas achieved her independence and 10 years later the war between Mexico and the United States broke out. The invasion of Mexico was rendered relatively easy by the repeated internal dissensions which absorbed most of the attention of the Mexican commanders. Twelve changes in the chief executive during the two years of the war prevented the Mexicans from offering any effective resistance, notwithstanding their admirable fighting qualities. The city of Mexico was occupied (Sept. 13, 1847), and in the Treaty of Guadalupe Hidalgo (q.v.) Mexico suffered heavy loss of territory. Santa Anna was the leading factor in affairs until August, 1855. General Ignacio Comonfort (q.v.) was installed as President in December and in June, 1856, issued the decree ordering the sale of all unimproved church lands, which precipitated the struggle between church and state. On Feb. 5, 1857, a new constitution, which, with its various amendments, is still in force, was adopted by Congress. Comonfort swore to defend the constitution, but, coming under the influence of the Reactionary party, he set it aside in January, 1858, and endeavored to govern the country under the Bases of 1843. A revolt under Gen. Félix Zuluoga drove him into exile. Benito Juárez (q.v.), the legitimate successor of Comonfort, assumed the presidency and proceeded to reëstablish constitutional government. The War of the Reform (of the church) broke out with all the fury of a religious warfare and in the midst of it Juárez issued his decree nationalizing all church property and separating the church and the state (July 12, 1859). The Constitutionalists, under General Ortega, decisively defeated the Reactionaries under Miramón, at Calpulalpam (Dec. 22, 1860), and a few days later Juárez entered the capital. Juárez proceeded to reorganize the internal administration of the country, but brought foreign war on the country by decreeing the suspension for two years of the payments on the foreign loan. The act, wise and perhaps necessary in itself, was not managed with diplomacy, and on Oct. 31, 1861, England, France, and Spain entered into the Convention of London, by which they agreed upon joint action for the protection of their interests in Mexico. An expedition was dispatched and Vera Cruz was occupied, but in February, 1862, when it became evident that Napoleon was scheming to establish an empire, supported by France, in America, England and Spain withdrew their forces. Thereupon the French came out openly against the Mexican government and were joined by the Reactionists and Monarchists, who were naturally hostile to Juárez. On May 5, 1862, a French army of 6000 men under General Lorencez was defeated before Puebla (the famous Cinco de Mayo) and was compelled to retreat to Orizaba. In September the arrival of reenforcements raised the French strength to 12,000 men. In May, 1863, a combined force of French and Mexicans, under the French General Elias Forey, captured Puebla and marched upon the capital, which fell into their hands on June 10 after Juárez and his cabinet had fled. Forey selected 35 citizens to act as a Supreme Council of the Nation. This body at once formed a

regency composed of Gen. Juan Nepomuceno Almonte (q.v.), Gen. Mariano Salas, and Archbishop Labastida, which was intrusted with supreme authority. On July 10 an Assembly of Notables at Mexico proclaimed Mexico an empire and tendered the crown to Maximilian, Archduke of Austria, brother of the Emperor Francis Joseph. (See MAXIMILIAN, FERDINAND JOSEPH.) Maximilian accepted the crown on condition that the action of the Assembly of Notables be ratified by a vote of the Mexican people. As a French army of 35,000 was present in the country, there was little difficulty in obtaining this. On May 29, 1864, Maximilian and his wife landed at Vera Cruz and on June 12 the sovereigns entered the capital, taking up their residence at Chapultepec, where they established a court with all the regalia and forms of a European dynasty. In the field the French troops under Bazaine, who had assumed command in October, 1863, gained a number of successes over the Patriot forces, and drove Juárez from place to place until he finally established his capital at El Paso del Norte on the United States border. In the desperate guerrilla warfare which the Nationalist forces waged against the invaders a large part of the country was devastated. Maximilian seriously undertook the task of governing the country and tried to reconcile the various parties, but in this he failed and by the end of 1865 he found himself, despite his efforts to win the good will of his subjects, with no real support except that of the French soldiers. Meanwhile the United States had convinced Napoleon III that French troops would not be suffered to interfere in American affairs. On May 31, 1866, Maximilian received word that the French army was to be withdrawn. He at once decided to abdicate, then changed his mind, at the instigation of the Empress Carlotta, who hastened back to Europe, where her failure to secure any help caused her to become insane. Maximilian again considered withdrawing, but the clericals urged him to remain and a council of leading Imperialists advised against the step, and eventually he determined to stay by his Empire and the supporters who remained true to him. As fast as the French troops were withdrawn from the northern part of the country, Juárez occupied the territory, re-formed his army, and awaited the final departure of the French (March, 1867). Maximilian removed the Imperial government to Querétaro, where the troops under Márquez, Miramón, and Mejía were assembled. The city was immediately surrounded by the Republicans and a siege begun on March 12, 1867. Márquez broke through the enemy to bring assistance from Mexico, but instead undertook to establish a power for himself at Puebla, where he was defeated by Porfirio Díaz, who drove him back to Mexico and then captured that city. On May 15 Maximilian was betrayed by one of his most favored officers, Col. Miguel López, who arranged the admittance of the enemy into the Imperial camp. The Emperor was forced to surrender, was tried by court-martial, and was shot, with Generals Mejía and Miramón, on June 19, 1867.

After four years Juárez entered the city of Mexico, on July 15, 1867, and began the reorganization of the Republic. A presidential election having resulted in no choice, Congress confirmed Juárez in that office, which he held till his death in 1872.

Sebastian Lerdo de Tejada (q.v.), the president of the Supreme Court, then succeeded to the presidency amidst great popularity. He pursued a policy of absorption of the states' rights and usurpation of power and prepared for his own reëlection in 1876 by having dictatorial powers granted. This was the signal for a new revolution and Gen. Fidencio Hernández issued the Plan of Tuxtepec (Jan. 15, 1876), which was adopted in a modified form by Gen. Porfirio Díaz, as the Plan of Palo Blanco (March 21). This latter plan included declarations in favor of the maintenance of the constitution of 1857 and the reform decrees of 1873, the nonreëlection of President and state governors, a new presidential election, and the repudiation of Lerdo de Tejada. Díaz defeated Lerdo de Tejada in the battle of Tecoac (November 16), entered the capital, and on November 28 assumed control of the executive power. The following year he was elected President for the unexpired term and began his long career as the ruler of the Mexican people. He ushered in a new epoch in Mexican history. He at once set about to insure a stable government, suppressing all opposition, and endeavored to extend the foreign relations of the country. In 1880 Díaz secured the election of his friend Manuel González as President and continued to exercise a power in the administration. The era of peace and prosperity inaugurated in the first term of Díaz continued; but many charges of corruption were made against González, and Díaz was considered as the only man who could properly govern the nation. He was reëlected in 1884, and before the end of this term the constitution was changed to allow the reëlection of the President and Díaz was chosen for and served out the five succeeding terms. During this period of 26 years, in which Díaz ruled practically as a benevolent despot, Mexico underwent a marvelous development, especially in economic and industrial lines. The public debt was funded and credit abroad was assured; the public revenues were regulated; foreign relations were improved and treaties of amity and commerce were negotiated; educational facilities were extended; the natural resources were developed and exploited; railways were extended; manufacturing plants were established; interstate taxes were abolished; the finances were put on a sound basis and the gold standard was adopted; a new banking law was enacted; and public works, harbor improvements, and public buildings were constructed.

Along with this material prosperity, however, came the development of oligarchical and autocratic tendencies in the government. Under the Díaz régime, both in the national and state governments, there sprang up many abuses, which caused uneasiness and silent protest. As the election of 1910 approached the administration party laid plans for the continuance of Díaz for another term of six years. Rumors of dissent from this arrangement became current, but it was scarcely thought probable that any one would have the daring to become a candidate in opposition to Díaz. No little surprise was occasioned at the publication of a book entitled *La sucesion presidencial en 1910* by Francisco Madero (q.v.), in which he openly attacked the Díaz régime, pointing out its corruption and abuses and declaring that he would wage a political campaign against it. He became the candidate of the opposition and ac-

tively carried on a political campaign of education, using American methods. He was not taken seriously at first by the followers of Díaz, and was repudiated by most of the other members of his own family, the wealthy Maderos of Coahuila. Finally concluding that Madero was an element of danger to the régime, the government caused his arrest upon a minor charge and thus eliminated him from the presidential canvass. On July 26, 1910, Díaz was reëlected for his eighth term, with Ramon Corral, one of his ardent supporters, as Vice President. Soon after the election (September 15–25) the centenary of the independence of Mexico was celebrated amidst the most brilliant festivities.

This was the last blaze of glory of the Díaz régime before its collapse. The suppression of Madero was the fact which, added to abuses and oligarchical tendencies of the Científico party, brought on a successful revolution. Madero, having been released from prison and warned from the country, began an active revolutionary propaganda. On October 15 he issued the Plan of San Luis Potosí, which proclaimed the principles of effective suffrage and no reelection, advocated certain land reforms, repudiated the Díaz régime and the election of 1910, and provided for open revolt and the organization of a provisional government. At the time of the actual outbreak in Chihuahua, on November 18, Madero was in the United States, but he at once returned to Mexico and took charge of the movement, which rapidly spread to the other northern states. The year 1911 opened with reverses for the federal government, though it continued to insist that the revolt was of little consequence and would soon be suppressed. The revolutionists demanded the immediate resignation of Díaz. As a reply Díaz, in his message of April 1, 1911, advocated reforms to safeguard the suffrage, reform of the federal judiciary, removal of abuses of the local officials, division of the large estates, and no reelection of the President. Because the fighting was carried on so near the border the United States government early in the year sent a warning to both parties and mobilized troops along the frontiers to guarantee neutrality and protect her interests.

On May 10, 1911, the city of Juárez was captured by the rebels and thereupon the federal government consented to negotiate for peace. The treaty provided for the resignation of Díaz and Corral and the holding of new elections within six months. Madero entered the capital on June 7, was chosen President, and inaugurated on November 6. With the best of desires to remedy the conditions of the country, he proved himself to be unable to cope with the situation. He had no sooner taken his seat as President than revolts broke out. Zapata (q.v.), a guerrilla leader in Morelos, who had led a movement against Díaz, now refused to submit to Madero and continued in arms against the government. Gen. Bernardo Reyes, a defeated candidate for the presidency, also attempted to start a revolt, but failed. A more serious outbreak occurred in February, 1912, in the north. Juárez was captured by the rebels and Gen. Pascual Orozco joined the movement and became its leader. The nearness of the disturbance to the United States frontier and the danger of violations of neutrality caused Congress to authorize and the President to issue an embargo on the shipment of arms to Mexico. This was later modified to allow shipments to the Madero government. Warning was sent, also, to both Madero and Orozco that they should protect the lives and interests of foreigners. The Federals gained victories in the north during the summer and seemed in a fair way to suppress the revolt, when a new movement took place in the south under the leadership of Felix Díaz, a nephew of Porfirio, who captured Vera Cruz. He was defeated, captured, and sentenced to death, but Madero suspended the sentence and removed Díaz to Mexico City for imprisonment.

Madero endeavored to carry out his programme of governmental reform, but in this he was unsuccessful, largely on account of his own character. Besides, his recognition of the old Congress left to the opposition a very effective weapon and the Científico press waged a relentless campaign against him. On Feb. 9, 1913, revolt broke out in Mexico City under the leadership of Felix Díaz and General Reyes. Sanguinary street fighting and the bombardment of public buildings continued for 10 days, until Gen. Victoriano Huerta (q.v.), the head of the federal army, deserted to the rebels. Madero and his Vice President, Pino Suárez, were arrested and forced to resign (February 19) and four days later they were murdered while being transferred from one prison to another. Huerta then assumed the provisional presidency. He and his followers justified their actions by accusing Madero of corruption, and promised reform in the administration.

Huerta experienced difficulties from the first. A counter-revolution was started in the north, led by Venustiano Carranza, the Governor of Coahuila. Governor Carranza was born in Coahuila in 1859 and was educated for the law. On account of weakness of the eyesight he took up farming, to which he has devoted most of his life. In 1893 he led a revolt against the Díaz Governor of Coahuila and succeeded in escaping with his life. He joined the Madero revolt in 1910 and upon its success became Governor of his native state.

Opposed to the course of events in the capital, Carranza secured extraordinary powers from the state legislature in order to defend the constitution. His scheme called for the establishment of a Constitutionalist army, and for the institution of several long-needed reforms. The revolt spread rapidly to Chihuahua, Sonora, and Sinaloa, and a Constitutionalist government was organized with Carranza as provisional president. Huerta's difficulties were further augmented by the attitude of the United States government. President Wilson continued President Taft's policy of non-intervention and non-recognition. The American Ambassador to Mexico, Henry Lane Wilson, advocated recognition, but as his ideas differed so widely from those of the President he felt compelled to resign. The President then sent John Lind (q.v.) as his personal representative, to undertake an adjustment of the Mexican situation. Promise of recognition of a new government in Mexico was given on the following conditions: The cessation of hostilities, the guarantee of an early and free election, the promise of Huerta not to become a candidate, and an agreement of all parties to abide by the result of the election. Huerta refused to agree to his own elimination, which was insisted upon and President Wilson adopted a policy of "watchful waiting." By a

coup d'état of Oct. 10–11, 1913, Huerta dissolved congress and assumed dictatorial power. He held an election, which he himself controlled, and was chosen President. President Wilson protested against the character of the election, but Huerta paid no attention to the protest.

In the meantime the Constitutionalists, under Carranza, had carried on an increasingly active campaign and by the middle of 1914 was in a position to threaten seriously Mexico City itself. Both factions were considerably hampered by the attitude of the United States. Protests were lodged with both sides against the disregard for the life and property of foreigners. An embargo was also placed again on the shipment of arms from the United States. Huerta was troubled also by the financial situation. The United States induced the financial world to boycott him and a threatened run on the banks of the country forced him to declare a bank holiday. He was compelled to resort to all means to secure funds.

On April 10, 1914, occurred the Tampico incident which gave a grave international aspect to the Mexican situation. A number of marines of the U.S.S. *Dolphin* were arrested, while landing from a launch flying the United States flag. Although the men were released and an apology made, Admiral Mayo deemed this insufficient and demanded a salute to the flag. President Wilson supported the demand and ordered the fleet to Mexican waters. In the diplomatic exchanges Huerta agreed in principle to grant satisfaction and hoped to secure recognition in the negotiations. Huerta's conditions were unacceptable and President Wilson appeared before Congress on April 20 and asked for authority to use the armed forces of the United States to secure reparation for the insult to the flag. War seemed imminent. The situation was further complicated by the seizure of Vera Cruz by American forces on April 21 to prevent the landing of a cargo of arms from Germany. At this juncture the A. B. C. powers (Argentine, Brazil, and Chile) offered their services as mediators. These were accepted and a conference was held at Niagara Falls, Canada (May 20–June 24). A protocol was drawn up, but it provided no practical solution for either the international or internal difficulties of Mexico.

During the summer months of 1914 the military successes of the Constitutionalists continued. The fall of San Luis Potosí and Manzanillo (July 17 and 24) gave the Constitutionalists control of the last remaining strongholds on the way to Mexico City. Huerta reorganized his cabinet in July and held a presidential election in the territory under his control. He was returned in this by a small majority. On July 15, he resigned the provisional presidency and was succeeded by Francisco Carbajol, Chief Justice of the Supreme Court. The latter at once made overtures for the surrender of the government to Carranza, asking for the assurance of an amnesty. At the suggestion of the United States Carranza finally agreed to the demands of Carbajol and the latter resigned having made Carranza Minister of Foreign Relations so that he might assume control of the provisional government. On August 15, General Obregon occupied the capital and on August 20, Carranza made his triumphal entry.

Factional strife almost immediately broke out. Followers of Carranza and Villa were in open conflict. Zapata, the southern leader, refused to follow Carranza because the latter failed to adopt his plans for agrarian reform. A convention of the Constitutionalist generals was called for October 1, in Mexico City, in order to decide on a plan of action and to choose a provisional President. The convention, after some delay, accepted Carranza's resignation. This action was later repudiated by Carranza and then the Convention declared itself supreme, chose Eulalio Gutierrez provisional President for 20 days, and placed Villa in command of its forces. Carranza was now openly hostile to the convention as was Zapata. The latter seized Mexico City on November 24, but held it only a short time. President Gutierrez continued in power more than his 20 days, but in January, 1915, he was repudiated by the Convention, which assumed control of the government in its own name. Gutierrez still maintained his right to the provisional presidency and Zapata continued to act independently, so that in reality Mexico had four factions, each pretending to control the government. In March the capital was occupied by each of the factions but held for a very short time. On June 2, President Wilson sent a warning to all factions that they adjust their differences and "act promptly for the relief and redemption of their prostrate country" or the United States would be "constrained to decide what means should be employed to help Mexico save herself."

On August 5, the representatives of Argentina, Brazil, Chile, Bolivia, Uruguay, Guatemala and the United States met at Washington to decide upon the course to be pursued in relation to the warring Mexican factions. The conference immediately resolved to send an appeal (August 11) to the leaders of the rival parties, in order to bring to an end the civil war and establish a provisional government. Villa accepted the offer, but after some delay it was rejected by Carranza. The Pan-American Conference met in New York on September 18, and decided that recognition should be given to the Mexican faction which possessed "the material and moral capacity necessary to protect the lines and property of natives and foreigners." The unanimous choice of the conference was Carranza and the Constitutionalists. Before granting recognition certain promises were secured from Carranza. These were: (1) protection of lives and property of natives and foreigners; (2) members of religious orders to be permitted to return and to be secure in life and property on condition that they did not enter politics; (3) that general amnesty be granted to Mexicans, except the real leaders of the opposing factions; (4) that the *de facto* government take steps to restore law and order, to provide for general elections, and the restoration of the Constitutionalist order in Mexico. On Oct. 18, 1915, Carranza was recognized as the Chief Executive of the Republic of Mexico. President Wilson ordered an embargo on all arms going into Mexico with the exception of those sent to the Constitutionalists. Foreign powers rapidly followed the lead of the American republics in recognizing Carranza. The new leader soon overpowered Zapata and Gutierrez and drove Villa back into his mountain fastness.

Early in 1916, Villa emerged from his retreat and involved the Carranza government in serious difficulties with the United States. On January 11, he seized 19 Americans from a train at Santa Ysabel, Chihuahua, and shot them. Upon the demand of the United States Carranza started a vigorous pursuit of Villa and his followers and succeeded in capturing some of his leaders, but Villa, himself, escaped. On March 9, at the head of 1500 bandits he raided the American town of Columbus, New Mexico, burned and looted it, and killed 15 civilians and 9 troopers. He then made his escape. After some negotiations, with Carranza, in which he did not show a very friendly attitude, a punitive force of American soldiers was sent into Mexico in pursuit of Villa. It was under command of General John J. Pershing. The expedition penetrated more than 300 miles into Mexican territory, but was unsuccessful as far as capturing Villa was concerned. The only serious engagement fought was at Parral where the American forces were attacked by Constitutionalists. While this expedition was seeking Villa he raided the town of Glenn Springs, Arizona. Another punitive expedition chased the bandits more than 150 miles into Mexican territory.

Carranza's attitude throughout these disturbances had been anything but friendly. He continually demanded the withdrawal of the American troops and on May 22, 1916, practically threatened to fire on any American troops in Mexican territory. President Wilson's reply to this was the calling out of the entire National Guard of the country and the strengthening of the forces on the Mexican border. Carranza's hostile attitude left General Pershing's forces in a very precarious position. A new position was taken by his troops much nearer to the border, where he could be easily reinforced by the thousands of militiamen that continued to come to the border. During the last three months of 1916 a joint American-Mexican commission was in session in the United States attempting to settle the difficulties in Mexico as well as to smooth out the international entanglement. Very little was accomplished, largely because the Mexican delegation insisted upon the withdrawal of the American forces and were reluctant to talk about Mexico's internal affairs. Nevertheless, the American troops were gradually withdrawn from Mexico, the last of them leaving in February, 1917.

On Dec. 1, 1916, a constitutional convention convened and drafted a constitution which was promulgated on Feb. 5, 1917. It was very liberal in form, with the exception of the provisions relating to the clergy which were very harsh. The provisions which drew the most attention from abroad, and aroused protests, were those regulating foreign capital. The government was empowered to expel any foreigner whose activities were considered dangerous or embarrassing, and new safeguards were taken against the concession of great oil and mining properties to foreigners, all natural resources being declared public property. Under this provision of the constitution a new tax was levied on oil lands and on oil contracts preceding May 1, 1917. The American government protested against this on the grounds that "the seizure of property at the will of the sovereign without legal process equitably administered, and without provision for just compensation has always been regarded as a denial of justice."

During October and November, 1919, relations between the United States and Mexico again became very strained. This was due to the seizing and holding for ransom of an American consular agent named Jenkins. The American government demanded his immediate release. The Mexican government at first refused, but after a second note was sent Jenkins was suddenly released and the tension relieved.

The Carranza government came to a sudden end in 1920. In April of that year a revolution broke out in Sonora and soon spread over the entire country. Generals Obregon and Gonzales, two of Carranza's strongest supporters, joined the new movement. Carranza fled from the capital, but was pursued by revolutionists and murdered on May 21. General Obregon was elected as his successor. The question of the recognition of the new ruler was intimately connected with the oil question (mentioned above). On Nov. 17, 1920, the American State Department announced that recognition must be withheld if the Mexican government made the provision of the constitution of 1917 relating to natural resources and the laws enacted under it retroactive. On June 7, 1921, Secretary of State, Hughes, proposed that a treaty of amity and commerce be signed with Mexico whereby Mexico should agree to safeguard property rights that had existed before the constitution of 1917 was adopted. Obregon refused this proposal declaring that the two countries should negotiate on an equal basis. The oil question was partially solved by agreements between the producers and the Mexican government (May 3, 1922), and the situation was considerably relieved by the decision of the Mexican Supreme Court, which said that the famous provision of the constitution of 1917 could not be considered retroactive. The settlement of the oil question seemed to smooth away many of the difficulties between the United States and Mexico and although the Harding administration withheld recognition, the relations between the two countries appeared to grow more cordial.

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MEXICO. An inland state of Mexico, bounded by the State of Hidalgo on the north, Tlaxcala, Puebla, and Morelos on the east, Morelos and Guerrero on the south, and Michoacan and Querétaro on the west (Map: Mexico, J 8). A part of this territory, adjacent to the State of Morelos and bounded on three sides by the State of Mexico, is occupied by the federal district, which is outside the jurisdiction of the state. Area, 9228 square miles. The surface is very diversified. In the north it is generally flat, with a few low hills and a number of lakes. The eastern part is taken up by the Popocatepetl Range with its two great volcanoes rising to an altitude of 17,000 feet. In the south rises the Ajusgo Range with its highest peak of over 13,500 feet, while the centre is occupied by the Sierra de las Cruces, exceeding 14,000 feet in its highest peak. The rivers are few in number, the chief among them being the Lerma, which rises in this state. There are a number of lakes in the eastern portion, the largest of which is Lake Texcoco. The climate is generally cold, owing to the mountainous character of the surface. In the valleys, however, it is temperate and healthful and even favorable to the cultivation of tropical fruits. The chief products are cereals, maguey, sugar cane, coffee, tobacco, and rice. The warmer regions produce tropical fruits. Stock raising is also an important and profitable industry. Mining is a growing industry; the chief metals are gold, silver, lead, copper, antimony, and iron. The great El Oro district is one of the leading gold-producing regions of the country. The state is also an important manufacturing centre; its products include cotton and woolen goods, flour, dairy produce, glassware, pottery, bricks, wines, and pulque. The state is traversed by several railway lines, all centring in Mexico City. Pop., 1900, 934,463; 1910, 989,510. The capital is Toluca (q.v.).

MEXICO. The largest and finest city in Latin North America and the capital of the Republic of Mexico. It is situated in the federal district on the west side of the valley of Mexico on the Anahuac plateau, 7350 feet above the sea, in lat. 19° 26′ N. and long. 99° 8′ W. (Map: Mexico, J 8). Its area is about 15 square miles. The city is 263 miles by rail from Vera Cruz on the Gulf of Mexico, 290 miles from Acapulco on the Pacific, 839 miles from Nuevo Laredo, the nearest railroad town on the United States frontier, and 1224 miles from El Paso, Tex. Its population by the census of 1900 was 368,898, and in 1910, 471,066. It is one of the most ancient cities of the continent and has been successively the capital of the Aztecs, of the Spanish viceroyalty of New Spain, and of the Republic of Mexico. It is the political, financial, and commercial centre of the Republic and is growing in importance as a manufacturing centre.

The valley in which it stands is an immense basin, approximately circular in shape, embracing some 2220 square miles, and completely encircled by high mountains, through which only two or three quite elevated passes afford an entrance. The view of the valley and of its girdling mountains and snow-capped volcanoes from elevations such as the towers of the cathedral or Chapultepec Hill, 3 miles west of the city, is superlatively beautiful. There is no natural exit for the waters which pour down the inner sides of the mountains, and they collect in six lakes scattered over the surface of the plain—Chalco and Xochimilco (fresh water), and Texcoco, Xaltocan, San Cristóbal, and Zumpango (salt water). In an early age nearly the entire surface of the valley was a lake bed, but for many centuries desiccation has been very gradually progressing until the waters are collected entirely in the six shallow basins whose extent

CITY OF MEXICO
THE CATHEDRAL

has been still further reduced by the drainage work recently completed. The waters of Xochimilco, however, were practically absorbed by the network of canals that irrigate the surrounding region.

Owing to the inadequate drainage and sewage systems and a soil permeated with the refuse of centuries, the city long had an annual death rate of 40 to every 1000 inhabitants, a larger proportion of mortality than in any other civilized city of the world. The conditions which promoted this high death rate have largely been remedied, and the city compares favorably with others in salubrity and is decreasing its death rate, though the unhygienic manner of life of the poorer classes swells the mortality. The city is naturally healthful, and in its climatic conditions is a delightful place of residence. The temperature is extremely equable, with an annual range of only 12 to 15 degrees. The mean temperature of the summer months is 60° to 65°, and the mean temperature in midwinter is about 53°. The prevailing winds, coming from the northwest, are damp; while the south winds, which blow only a sixth of the time, are very dry. The total rainfall is about 20 inches, or about half of that at New York.

From its three centuries of Spanish domination Mexico still preserves many characteristics of the great cities of Spain, and from a certain Oriental suggestion in its appearance far surpasses them in novelty and interest. Along with the wonderful commercial development that has characterized the last quarter of a century are to be found evidences of an artistic plan to preserve more beautiful forms of architecture than are usually associated with a modern industrial city, with the result that here may be found an artistic centre for local color not equaled elsewhere on the American continent. Seen from a distance the city, prevailingly white in color, is an imposing spectacle. Spreading widely over the plain, overtopped by domes and pinnacles, and hemmed around by majestic mountains, few cities of the world are more charming and impressive.

Most of the houses have terraced roofs and inner courts, are solidly built of sandstone or lava, and are only one to two stories in height, a precaution against the frequent though usually slight earthquakes; but many of the business and public buildings, supported on solid foundations of piling, are three and even more stories in elevation, and some of them reach an altitude of five stories. The walls of many of the poorer buildings are not quite perpendicular, owing to earthquake shocks and the insecure foundation soil of the city, thus giving to some of the street fronts a rather rickety appearance. The later buildings along the business streets are making greater use of steel in their construction, a practice serving to avoid the above difficulties.

Buildings. The cathedral, situated on the north side of the Plaza de la Constitución and built on the site of the great temple of Huitzilopochtli, the titular god of the Aztecs, is one of the largest and most sumptuous churches in America. It was commenced in 1573, dedicated in 1667, and completed in the nineteenth century, at a cost of over $2,000,000. It is rectangular in form, 426 feet long and 203 feet wide. The interior is in Doric style with traces of Gothic and has a single nave and transept, forming a Latin cross, two aisles, and 13 side chapels. The massive and tasteless high altar is surrounded by a tombac (copper and zinc alloy) railing which is surmounted by 52 statuettes. The huge quadrilateral choir is closed in front by a magnificent tombac grill and is connected with the high altar by two railings of the same material. To the rear of the high altar is the chapel of the kings, in Churriguueresque style and the finest in the cathedral. The façade is an attractive example of the architecture of the Spanish Renaissance, blending the Ionic, Doric, and Corinthian orders. Flanking the façade are two open towers, 218 feet high, which were completed in 1791. Facing the plaza on the east side of the cathedral and forming an integral part of it is the Sagrario Metropolitano, one of the parish churches of the city. In addition to the cathedral, Mexico contains some 60 churches, among which the finest are La Profesa, Loreto, Santa Teresa, Santo Domingo, and San Hipólito. A number of Protestant denominations also have houses of worship in the city.

The National Palace, of poor and monotonous architecture, occupies the east side of the plaza. It has a frontage of 675 feet, and with its associated buildings covers an area of 14,000 square meters. It contains the offices of the President, the Senate Chamber, the ministries of Finance and of War, the federal treasury, and the public archives. On its walls are some remarkable paintings by Miranda and other native artists. North of the National Palace and forming a part of it is the National Museum, with its sections of archæology, natural history, anthropology and ethnography, and Mexican history. It contains priceless collections of Aztec relics, remains of large animals of the Quaternary epoch, and an extensive collection of paintings. The National Observatory and the Meteorological Bureau are also located here. The Monte de Piedad, the famous national pawnshop of Mexico, with nearly 10,000,000 pesos of accumulated funds, stands close to the cathedral, and with its liberal management is really a beneficent charity. Facing the cathedral is the Palacio Municipal, or city hall, containing the city and federal district offices.

In recent years many imposing edifices have been constructed. The Legislative Palace, facing the Plaza de la República, is one of the finest structures of Latin America and was built at a cost of 10,000,000 pesos. The Central Post Office, just back of the National Theatre, is a fine example of the Plateresque style and was completed in 1907 at a cost of 2,921,000 pesos. The National Penitentiary, at the eastern edge of the city, is a large and perfectly equipped institution, which was opened in 1900. Other notable buildings, all of them old and of historic interest, are the School of Medicine on the Plaza Santo Domingo, occupying the quarters in which the Inquisition made its infamous history; the church of the Jesuits; the School of Arts, where many branches of industry are taught; the National Picture Gallery of San Carlos, in which the Florentine and Flemish schools are especially well represented; the National Library, formerly the church of San Agustín, with over 200,000 volumes, numerous manuscripts, and rare old Spanish books; the Mint, in which silver and gold have been coined since 1690, to the value of nearly $3,000,000,000; the Itúrbide Hotel; and the School of Mines, designed by the artist Tolsa, one of the finest

structures in Mexico, with rich mineralogical and geological collections and containing also the School of Engineering with its observatory. There are 19 hospitals, many of them dating from colonial times and occupying old buildings; the General Hospital and the Insane Asylum, however, are of the most modern type.

One of the curiosities of the city is the little old building in which the first printing in America was done. There are over 200 periodical publications registered in the capital, including about a score of dailies. They administer to every phase of the intellectual and artistic life, a number being printed in English, German, and French. The Geographical and Statistical Society, which issues many maps and charts, is the principal scientific institution of the country. The educational system of the city comprises the university, with its various faculties; technical and professional schools, including two normal schools, an engineering school, a school of fine arts, a conservatory of music, and a school of commerce; numerous public schools of primary and secondary grade; and many private institutions.

Streets and Parks. Mexico is said to be the finest-built city on the American continent. Some of its thoroughfares, paved with asphalt and lined with houses whose height bears a strict architectural relation to the width of the streets, certainly bear out this assertion. Its 2500 streets and lanes are laid out with great regularity, running generally from north to south and from east to west, except in some of the newer sections, and intersecting at right angles. The monotony of this arrangement is broken by an occasional public square or garden, while in the suburbs there are numerous diagonal streets and avenues. Many of the streets are very narrow, especially in the older portion of the city lying within the line of the old walls. Even where the streets are wider the sidewalks are usually too narrow to accommodate the passers-by. Formerly the system of street names was a bewildering puzzle, the same street changing its name many times. This condition has been remedied somewhat by the readjustment of the nomenclature made in 1908 and 1909. Starting from the Plaza de la Constitución, the electric tramway system reaches all parts of the city and the suburbs. The principal streets are electrically lighted and are clean and well kept.

San Francisco Avenue, the leading business thoroughfare, connects the Plaza Mayor with the Alameda and reminds the visitor strongly of the fashionable shopping districts of European centres. Here shops, with their costly displays of all sorts of merchandise, the best hotels, cafés, and restaurants, the business offices and clubs, pour forth during the later afternoon hours their elegantly attired throngs that overflow the narrow sidewalks and fill the costly equipages and hackney coaches moving in a double line along the crowded street. San Francisco Avenue is interesting any day, but it is doubly so when processions of flower-bedecked carriages, columns of troops in showy uniform, and the gayly decorated fronts of the buildings proclaim the celebration of the fiestas of September or of the Cinco de Mayo (Fifth of May). The avenue Cinco de Mayo, a rival of San Francisco Avenue and running parallel to it, extends from the cathedral to the new National Theatre. The Paseo de la Reforma is the finest avenue and drive in the Republic and is the highway of Mexican social life. It was constructed by the order of Emperor Maximilian and extends a distance of 2 miles from the Alameda to the hill of Chapultepec. It has a double avenue of fine trees, shading well-constructed stone sidewalks, which are lined with beautiful residences. There are six glorietas (circular parked expansions), each 400 feet in diameter, every one exhibiting a wealth of flowers and shrubbery and some surmounted with fine monuments of historic interest. Its terminal parks are of rare beauty and are in the midst of an architectural setting that each year becomes more imposing. It is no wonder that every afternoon from five to seven o'clock the paseo is the favorite parade ground for every Mexican who owns or can afford to hire an equipage. Along the line of handsome vehicles one occasionally detects a touch of domestic color in the person of some caballero in native costume, but such appear with less frequency as the years pass on, and the Mexican Vanity Fair approximates more closely to the ordinary park processions of the great world centres.

A spot hardly second to the paseo in interest is the beautiful park and promenade known as the Alameda. With its 40 acres well shaded with poplar and beech trees and variegated with a most profuse collection of semitropical plants and shrubs, it has long been the favorite stamping ground of Mexican aristocracy, whose weekly parade on Sunday from eleven to one exhibits the fashionable life of the capital at its best. Here a fountain now stands on the site of the Quemadero, or burning place of the Inquisition, where many a heretic expiated his heresy at the behest of the then all-powerful church and had his ashes thrown into the ditch flowing behind the neighboring sanctuary of San Diego. The central Plaza de la Constitución, or Plaza de Armas, or Plaza Mayor, surrounded by the magnificent cathedral, the National Palace, the municipal buildings, and some of the finest retail stores, seems more truly than any other spot the real centre of the city. It covers 14 acres and is beautified by trees, flower plots, statuary, and marble fountains, while in the centre is the charming band stand which gives to it its popular name of Zócalo. Formerly the centre of the commercial life of the metropolis and still that of the political life, it is the scene of the patriotic celebrations so dear to the heart of its populace. It is here, during the fiestas of September, that one can view the floral parade of the fourteenth; can listen to the charming military concerts of the fifteenth and behold the gorgeous electric and pyrotechnic display that follows the commemorative ring of the grito of Hidalgo; and on the sixteenth can see the parade of column after column of Mexico's well-drilled troops.

Monuments. The city, which contained the first academy of fine arts erected upon the American continent, still affords many examples of the artistic instinct of its people in its well-built public and private residences and in important groups of statuary. Among the most important of these is the equestrian statue of Carlos IV, begun in 1794 and finished in 1803, the work of a native artist, Manuel Tolsa. Originally placed on the Plaza Mayor, it is now situated at the city terminus of the paseo. In the first glorieta of the paseo is the monument to Christopher Columbus; in the second, that to

Cuauhtemoc, the last of the Aztec rulers, one of the most impressive structures on the American continent; and in the fourth, the monument to the national independence, an imposing structure combining modern and classic styles and completed in 1910. The striking Benito Juárez Monument, facing Juárez Avenue midway along the Alameda, was constructed in commemoration of the hundredth anniversary of the independence. The tomb of Juárez in the pantheon of San Fernando is a noteworthy piece of Mexican art.

Clubs and Theatres. As may be imagined, the social life of Mexico City, from a Latin-American point of view, is exceedingly attractive. In addition to many native organizations, all of the principal foreign colonies have a social centre, the British and the Americans being especially well housed. The Jockey Club, a native organization, has as its headquarters one of the finest buildings in the city, formerly the palace of the Count del Valle. The new National Theatre, a government undertaking, located at the eastern end of the Alameda, is the largest and finest theatre in the Republic. Among the other playhouses are the old Teatro Nacional, the Teatro Colón, the Teatro Arbeu, and others of lesser note. In no other country except Spain is bullfighting so popular, and although the administration of Díaz made quiet efforts to bring the sport into disrepute, the two bull rings are well thronged on festal days and at the Sunday performances.

Suburbs, etc. Extension of the tramway system resulted in a great expansion of the older city and a development of the suburban towns. One of the earliest additions to the old city was the Colonia Juárez, which was laid out in 1890 and lies just south of the Paseo de la Reforma. Here American ideas of architecture and hygiene were developed and have exerted a great influence upon the city. This handsome colonia is the centre of the American, English, French, and German wealth and fashion of the metropolis. To the south of the Colonia Juárez are the colonias Roma, Condesa, and Hidalgo, and to the north are the colonias Cuauhtemoc, San Rafael, and Santa María, all patterned after the original colonia and forming the chief residential sections of the city. Just to the west of the Colonia Juárez and at the far end of the paseo is Chapultepec, a mass of rock rising some 200 feet from the midst of magnificent cypress groves and topped by the splendid structure containing the National Military Academy and the President's summer palace, from which may be obtained the finest view of the valley. The older suburban towns, while not so desirable as places of residence, are full of historic interest. To the southwest of the city is Tacubaya, the most fashionable resort of Mexico, situated in the most fertile portion of the federal district. Here is located one of the national observatories, occupying a former palace of the Archbishop of Mexico. To the north of the city lies Guadalupe Hidalgo, whose beautiful and rich church is the Lourdes of Mexico and whose traditional Virgin has become the tutelar divinity of the modern Republic. To the south is the Viga Canal, lined with the so-called floating gardens, the region which furnishes the flowers, fruits, and vegetables for the city markets and whose inhabitants present some of the most interesting pictures of contemporary native life. Upon this canal are the towns of Santa Anita and Iztacalco, interesting pleasure resorts frequented by the lower classes. Also to the south is Tlalpam, a resort second only to Tacubaya in importance. To the west, Popolta contains the Noche Triste tree, under which tradition says that Cortés wept on the night of his expulsion from Mexico. By rail it is possible to extend one's excursions beyond the mountain valley to the most interesting points of ancient and modern Mexican history, all of which are within easy distance of the capital.

Industries and Commerce. The high price of fuel long hampered the industrial development of the city. The use of electric power, however, has produced a great increase in the industries. In 1914 there were 153 manufacturing establishments in the city, producing cotton, linen, and silk textiles, leather, boots and shoes, alcohol, beer, flour, cigars and cigarettes, chocolate, hats, ice, furniture, pianos, matches, glass, soap, bricks, carriages, etc. The textile and cigarette enterprises are the most important. In the suburban towns also there are numerous factories. A large part of the trade interests is in the hands of French, German, and English merchants. (For communications with the United States and other countries, see MEXICO.) The city is the wholesale centre for the nation, and its banks, of which the most important are the National Bank of Mexico, capitalized at 32,000,000 pesos, the Mexican Central Bank, capitalized at 30,000,000, and the Bank of London and Mexico, capitalized at 21,500,000, control its financial conditions. Its 15 markets are large and well ordered and a perpetual convenience to its inhabitants.

Drainage and Water Supply. The city derives its water supply from the western mountains, the greater portion coming from the vicinity of Tacubaya. For the transportation of the water there has been constructed a series of aqueducts, the first of which was completed in 1576 and the last was opened in 1910. Upon the inauguration of the new system, in this latter year, there was available an average of 400 liters per day for each inhabitant of a population of 545,000. New plans were made to secure a more even distribution of the water supply, especially in the poorer sections, where the lack of water had contributed greatly to the unsanitary conditions.

The drainage works, which have vastly improved the sanitary conditions, were completed in 1900 after three centuries of more or less spasmodic effort and at the cost of the lives of many thousands of men and many millions of dollars. The great evils from which the city of Mexico suffered for many generations were inundations from Lake Texcoco and disease promoted by the fact that the city stood in the bottom of an undrained natural sink. The lake, suddenly filled by downpours from the mountains, sometimes buried the streets in water for weeks. Thirty thousand persons were drowned by the sudden submergence of the city in 1629, and similar catastrophes were caused by other floods. It was to rescue the city from inundations that the drainage works were begun three centuries ago, but it was not till 1789 that the city ceased to be menaced by deluges. Up to 1830 the total expenditure on the drainage works had been $8,000,000, but the menace of malaria and epidemics had not yet been removed. The canal was not deep enough, the lake was still very little below the mean level of the city,

and the fall was not sufficient to carry off the sewage. The gigantic works, which were not seriously undertaken till 1885 and completed in 1900, now rank among the great engineering achievements of modern times. The works consist of sewers carrying the waste of the city to a canal starting from the San Lázaro gates and extending for 43 miles, its course being deflected so as to cut Lakes San Cristóbal, Xaltocan, and Zumpango. Near the town of Zumpango the canal empties into the tunnel, completely lined with brick, which has been dug through the mountains a distance of 32,869 feet to a river which carries the sewage to the Gulf of Mexico. These works thus carry all the surplus waters and sewage of the city of Mexico outside of the valley, and also control the entire waters of the valley, affording an outlet to those that might otherwise overflow fields and towns.

Government. With the exception of the temporary organization of a municipal government at Vera Cruz to further the ambitious plans of Cortés, the municipal corporation of Mexico City was the first to be established upon the American continent. The probable date of its establishment by the Great Conqueror is 1522, but the earliest preserved record of its meetings is that of March 8, 1524. In that year the officers consisted of two alcaldes (municipal judges), four regidores (members of the council), a procurador (attorney), and a notary. Later the number of regidores was increased to six. The first council was appointed by Cortés. Afterward the regidores were appointed annually by the Governor and royal officials upon nomination by the people, and the alcaldes were chosen by the regidores. Later there were 15 perpetual and hereditary regidores, who were either appointed by the crown or purchased their office. They were empowered to name two alcaldes every year and six regidores and an attorney every two years. By this arrangement the city council became a closed corporation. It offered, however, the only official positions which were open to the creoles. Its powers were never clearly defined, but in general it busied itself with the local government, including the police power and administration of justice.

Although created at first as the creature of Cortés, the cabildo (municipal corporation) of Mexico soon became a powerful body, strong enough in some cases to make or mar the reputation of succeeding viceroys. It greatly interfered with the salutary reforms of the Count of Revilla Gigedo (1789–93), and on the abdication of Ferdinand VII in 1808 it took a prominent part in the assembling of a general junta of New Spain to resist the pretensions of Joseph Bonaparte.

Following the declaration of Mexican independence and the division of New Spain into the states of the Republic of Mexico, there arose a conflict between the state authorities of Mexico and the national government which resulted in the creation, Nov. 18, 1824, of a federal district, comprising the territory within a radius of two leagues of the main plaza. The federal district was subsequently enlarged, until it comprises 12 municipalities besides that of Mexico, which of itself covers 15 square miles. The city now has an Ayuntamiento Constitucional (Constitutional City Council), consisting of 21 members, elected by a popular vote. It chooses its own president and vice president. The Ayuntamiento is quite overshadowed by the Superior Council of the federal district, which consists of the Governor of the district, the Director General of Public Works, and the president of the Superior Board of Health. This council, which is responsible directly to the president, controls much of the local administration. It must, however, consult the Ayuntamiento in all matters of a general importance to the municipality, such as the water supply, sanitation, and contracts. The Ayuntamiento holds a limited veto power in respect to contracts affecting the city. The income of the municipality is derived from taxes on the water supply, commercial establishments, public amusements, slaughter houses, vehicles, and pulque. The revenues of the city have increased greatly, in 1911–12 amounting to 4,461,461 pesos, of which 1,030,920 was from the pulque tax.

History. The city dates from about 1325 A.D., when the Aztecs, looking for a favorable site, saw perched on a cactus an eagle devouring a snake. The omen was interpreted to mean that this was to be the site of their city; hence its original name, Tenochtitlan (cactus on a stone), changed later to Mexico in honor of the war god Mexitli. With the progress of Aztec culture the city expanded and improved, and about 1450 tradition reports that the mud and rush houses were replaced by solid stone edifices built partly on piles amid the little islands of Lake Texcoco. The Aztec city was an imposing spectacle at the time of the arrival of the Spaniards in 1519, when it is reported to have contained at least 50,000 buildings and several hundred thousand inhabitants. It was about 10 miles in circumference, everywhere intersected by canals and connected with the mainland by six long and solidly constructed causeways. It was thus essentially a lacustrine city, but the subsidence of Lake Texcoco has left the modern city high and dry, with the lake 2½ miles away. The Aztec city was almost wholly destroyed by Cortés, who in 1521 employed the friendly natives to rebuild the city on the same site. Under Spanish domination the city in 1600 contained about 15,000 inhabitants, which number gradually increased to 120,000 two centuries later.

The city is full of historic interest and has been the scene of many events of national importance. It was captured by the United States after the battle of Chapultepec, on Sept. 13, 1847, and by the French forces under Marshal Forey in 1863. Upon the downfall of Emperor Maximilian, Juárez entered the city (July 15, 1867), and on Nov. 23, 1876, Díaz was here proclaimed provisional President and began his long régime. In February, 1913, 10 days of sanguinary street fighting and bombardment of public buildings took place during the struggle between the Madero government and the Revolutionists under Felix Díaz and Gen. Bernardo Reyes. It was occupied by the Constitutionalists in August, 1914, and subsequently was alternatively in the hands of Carranza, Zapata, and Villa. It suffered greatly from the chaotic conditions existing in 1915. In spite of its misfortunes it is a leading centre of intellectual and industrial development of Latin America, and is at once one of the most interesting and most promising cities of the western continent.

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MEXICO. A town of Luzon, Philippines, in the Province of Pampanga (Map: Luzon, D 6). It is situated on an arm of the Pampanga Delta, 5 miles northeast of Bacolor. Pop., 1903, 13,469.

MEXICO. A city and the county seat of Audrain Co., Mo., 110 miles by rail northwest of St. Louis, on the Wabash, the Chicago and Alton, and the Chicago, Burlington, and Quincy railroads (Map: Missouri, E 2). It is the seat of Hardin College for Women (Baptist), founded in 1873, and of the Missouri Military Academy; and contains a Carnegie library and fine high school and post office buildings. There is a considerable trade in horses and cattle, and the industrial establishments include flour mills, shoe and ice factories, fire-brick, marble, stove-lining, and cigar works. The surrounding region abounds in clay of an excellent grade. Settled in 1833, Mexico was incorporated in 1852. The government is administered under a charter of 1893, which provides for a mayor, elected biennially, and a unicameral council. Pop., 1900, 5099; 1910, 5939.

MEXICO, Gulf of. A partially inclosed basin of the Atlantic Ocean, having the United States on the north and Mexico on the west and south. It has an extreme length from east to west of about 1100 miles and a breadth from north to south of 800 miles; its area is estimated at 700,000 square miles (Map: America, North, J, K, 7). The opening of the gulf eastward is narrowed by the peninsulas of Florida and Yucatan, which approach within 450 miles of each other. Near the middle of the outlet lies the island of Cuba, forming two passages—the Strait of Florida, 125 miles wide, between Florida and Cuba, and the Yucatan Channel, 120 miles wide, between Cuba and Yucatan. The north entrance connects with the Atlantic Ocean and the south with the Caribbean Sea. The basin of the gulf attains a maximum depth of 12,700 feet, while a large proportion of its area exceeds 10,000 feet in depth. From Florida west to the Mexican boundary the shores form a part of the coastal plain and slope so gradually that the 100-fathom line is distant 100 miles or more from land. Off the Mexican coast, however, the basin rapidly sinks to the level of the submarine plain known as Sigsbee's Deep, which has an average depth of 12,000 feet. The passages leading to the Caribbean Sea and the Atlantic are relatively shallow. The gulf contains few islands and these are located in proximity to the coasts; the Florida Keys, the delta of the Mississippi, and the islands on the coast of Yucatan are the most important. Numerous small bays and innumerable lagoons inclosed behind sand bars give relief to the coast line, which is otherwise quite regular. The Bay of Campeachy, between Yucatan and the main mass of Mexico, is the only broad indentation. Owing to the low shores, good harbors are not numerous, the best being those of Vera Cruz, Galveston, Mobile, Tampa, Pensacola, and Havana. The principal rivers flowing into the gulf descend from the United States, and include the Mississippi, Rio Grande, Colorado of Texas, Brazos, Sabine, Mobile, and Apalachicola. The prevailing winds from March to September are the northeast trades, while during the colder portion of the year, owing to the relatively high temperature of the gulf, there is a cyclonic inflow of air, associated with strong northerly winds, which sometimes move with terrific force, causing violent gales. The tides in the gulf rarely exceed 4 feet for the spring tides, and 2½ feet for the neap tides. The most remarkable feature in connection with the Gulf of Mexico is the Gulf Stream (q.v.), which enters it by the south channel, passes round it, and emerges through the Strait of Florida. The swiftest portion of the stream, as it issues from the gulf, has a velocity of more than 4 miles per hour. Owing partly to the presence of this heated current, the temperature of the gulf is eight or nine degrees higher than that of the Atlantic in the same latitude.

MEYER, mī'ĕr, Adolf (1866–). An American pathologist and alienist, born at Niederwenigen, near Zurich, Switzerland. Having studied medicine at Paris, London, Edinburgh, Vienna, Berlin, and Zurich (M.D., 1892), he came to the United States; lectured on neurology at the University of Chicago (1892–95); and served as pathologist to the Illinois Eastern Hospital for the Insane at Kankakee, Ill. (1893–95). While pathologist and later director of the clinical and laboratory work of the Worcester (Mass.) Insane Hospital, he lectured on psychiatry at Clark University (1895–1902). From 1902 to 1910 he served as director of the Pathological Institute of New York State Hospitals and in 1904–09 also as professor of psychiatry at Cornell University Medical College; and in 1910 he was appointed to the corresponding chair at Johns Hopkins University and director of the Henry Phipps Psychiatric Clinic of Johns Hopkins Hospital. He was president of the New York Psychiatric Society and of the American Psychopathological Association. Besides contributing to the New International Encyclopædia, he published *Dementia Præcox*, with others (1911).

MEYER, Adolf Bernhard (1840–1911). A German zoölogist and anthropologist, born in Hamburg. After a prolonged course of study in medicine and natural history at the universities of Göttingen, Vienna, Zurich, and Berlin, he explored the Malay and Philippine Islands, and in 1874 became director of the Dresden Royal Museum of Natural History, retiring in 1905. Among his writings are *Abbildungen von Vogelskeletten* (1879–95); *Publikationen des königlichenethnographischen Museums zu Dresden* (1881–1903); *Album von Philippinentypen* (1885–1904); *The Birds of Celebes* (1898); *The Distribution of Negritos* (1899); *Studies of the Museum* (of Natural History) *and kindred Institutions of New York, etc.* (1905); *Amerikanische Bibliotheken und ihre Bestrebungen* (1906); *Römerstadt Agunt* (1908).

MEYER, Annie Nathan (1867–). An American author and promoter of the higher education of women, a sister of Maud Nathan. She was born in New York City and in 1887 was married to Dr. Alfred Meyer. She was instrumental in founding Barnard College, New York, now a part of Columbia University, and became known also as an opponent of woman suffrage. At one time she was associate editor

of the *Broadway Magazine*. Besides editing *Woman's Work in America* (1891) and contributing a series of articles on "Higher Education for Women" to the New York *Evening Post*, Mrs. Meyer published *Helen Brent, M.D.* (1892); *My Park Book* (1898); *Robert Annys: A Poor Priest* (1901); *The Dominant Sex* (1911); *The Dreamer* (1912).

MEYER, Balthasar Henry (1866–). An American railway expert, born at Mequon, Ozaukee Co., Wis. He graduated from the Oshkosh Normal School in 1893; studied at the University of Berlin in 1894–95; and finished his education at the University of Wisconsin (B.L., 1894; Ph.D., 1897), where he was instructor in sociology (1897–99), assistant professor of sociology (1899–1900), and professor of political economy (1900–10). He served as member (1905–11) and chairman (1907–11) of the Railroad Commission of Wisconsin; was a member of the United States Railroad Securities Commission in 1910; and was appointed by President Taft a member of the Interstate Commerce Commission in January, 1911. He had charge of the valuation of railroads in the United States in 1904–05. He is author of *Railway Legislation in the United States* (1903); *A History of the Northern Securities Case* (1906).

MEYER, Christian Erich Hermann von (1801–69). A German paleontologist, born at Frankfort-on-the-Main. He was educated at Heidelberg and at Munich and from 1837 to 1866 was connected with the financial administration of the government. He received the Wollaston medal from the Geological Society of London in 1858. The published results of Meyer's paleontological researches include: *Palæologica zur Geschichte der Erde und ihrer Geschöpfe* (1832); *Die fossilen Zähne und Knochen und ihre Ablagerung in der Gegend von Georgensgmünd* (1834); *Neue Gattungen fossiler Krebse* (1840); his most important work, *Zur Fauna der Vorwelt* (4 vols., 1845–60); *Die Reptilien und Säugertiere der verschiedenen Zeiten der Erde* (1852).

MEYER, Claus (1856–). A German genre painter, born at Linden, near Hanover. He studied first at the School of Arts in Nuremberg, then at the Munich Academy, chiefly under Löfftz, whose influence led him to an intimate study of the Dutch masters of the seventeenth century. He acquired such delicate nuances of color and subtle characterization as almost to equal his models. His best-known works are Flemish or Dutch interiors with quiet contemplative figures or merry groups, painted with exquisite detail and fine naturalism. Such are "The Dice Players" (Berlin Gallery); "Merry Company" (Düsseldorf); "Dutch Interior" (1882); "Sewing Room in a Béguine Convent" (1883, Munich Gallery), awarded the great gold medal at the International Exhibition in Munich. "Old and Young Cats" (1885, Dresden Gallery) and "Infants' School" (1888, Karlsruhe Gallery) are also notable. Meyer was professor at the School of Art in Karlsruhe in 1891–95, and afterward at the academy in Düsseldorf. His later works include religious pictures, such as "Christ Among the Doctors" (Barmen Gallery) and "Fear Not"; also some notable mural decorations in the city hall at Duisburg and in Castle Burg on the Wupper. Consult Board, in *Kunst für Alle* (Munich, 1907), and Schippang, in *Kunst unserer Zeit* (ib., 1909).

MEYER, Eduard (1855–). A German historian, born at Hamburg and educated at the universities of Bonn and Leipzig. He was appointed professor at Breslau in 1885, at Halle in 1889, and at Berlin in 1902. He lectured at Harvard in 1909. Honorary degrees were given him by Oxford, St. Andrews, Freiburg, and Chicago universities. His principal work is his *Geschichte des Altertums* (1884–1902; 3d ed., 1913). He also published: *Forschungen zur alten Geschichte* (1892–99); *Untersuchungen zur Geschichte der Gracchen* (1894); *Wirtschaftliche Entwickelung des Altertums* (1895); *Die Entstehung des Judentums* (1896); *Zur Theorie und Methodik der Geschichte* (1902); *Die Israeliten und ihre Nachbarstämme* (1906); *Der Papyrosfund in Elephantine* (1912).

MEYER, George von Lengerke (1858–1918). An American political leader, diplomatist, and cabinet officer, born in Boston. He graduated at Harvard in 1879 and from then until 1899 maintained active mercantile and banking interests. He served as common councilman and alderman of Boston and as a member of the Massachusetts House of Representatives (1892–97), being Speaker during the last three years. In 1900–05 he was Ambassador to Italy and then for two years Ambassador to Russia. In 1907 he became Postmaster-General, under President Roosevelt, and during President Taft's administration he was Secretary of the Navy. He served on the Republican National Committee from 1898 to 1904.

MEYER, Hans (1846–). A German engraver, etcher, and painter. He was born in Berlin and studied under Mandel and at the Berlin Academy, and later traveled in Italy, Holland, Belgium, and France. He became a professor at the Academy for Fine Arts in Berlin, and received many honors, including medals at Munich in 1891, Chicago in 1893, Antwerp in 1894, and the great gold medal at Berlin in 1899. Among his best plates are "Poetry" after Raphael; "Mary and Elizabeth" after Moretto; "The Lady with the Glove" after Van Dyke; "Peace and War" after Geselschap's mural paintings in the Berlin Hall of Fame; and a series of fantastic original etchings, the "Dance of Death." He also painted landscapes in water color and tempera.

MEYER, Hans (1858–). A German explorer and publisher. He was born at Hildburghausen and studied science and political economy at Leipzig, Berlin, and Strassburg. He traveled in Asia, North America, and South Africa (1883) and in 1887 explored Kilimanjaro in East Africa. After several venturous attempts to ascend the mountain he reached the top of the higher of the two peaks, the Kilbo summit (1889), where he found a crater more than a mile wide and about 19,700 feet above the sea. In 1898 he made an exhaustive study of the mountain and its glaciers and wrote *Der Kilimandjaro* (1900). In 1884 he entered the Bibliographisches Institut (Leipzig), founded by his grandfather, Joseph Meyer (1796–1856). Upon the retirement in 1885 of his father, Hermann Julius (1826–1909), Hans Meyer and Arndt Meyer became directors of the well-known publishing house. In 1903 Herman Meyer joined the firm. In 1903 Hans studied the glaciation of the Ecuadorian Cordilleras. In his *Zum Schneedom des Kilimandscharo* (1888) he gives a full account of his experiences and discoveries in that region. In 1908 he made another trip to East Africa. Among his other

writings are *Eine Weltreise* (1884); *Ostafrikanische Gletscherfahrten* (1890); *Die Eisenbahnen im tropischen Africa* (1902); *In den Hoch Anden von Ecuador* (1907); *Das deutsche Kolonialreich* (1909, 1910), with others.

MEYER, Heinrich (1760–1832). A Swiss writer on art and antiquity. He was born at Zurich and studied painting there under Füessli. In 1784 he went to Italy and at Rome in 1788 he met Goethe, with whom he contracted a friendship so intimate that he was known in Germany by the name of "Goethe-Meyer." In 1792, through the influence of Goethe, he was appointed a professor in the Weimar Academy of Design. Three years later he revisited Italy, and in 1797 returned to Weimar, where he was made a director of the academy in 1807. Many of the critical portions of Goethe's essays on art in *Kunst und Altertum* are to be credited to Meyer, and he also assisted Goethe in his *Propyläen*. As a painter, his production was scanty. He edited, with extensive annotations of his own, the works of Winckelmann (1808–20). These notes he subsequently expanded into a general history of Greek art, which appeared under the name of *Geschichte der bildenden Künste bei den Griechen und Römern* (with an additional volume by Riemer, 1824–36). He died at Weimar, leaving to that city a bequest of 33,000 thalers for the establishment of a foundation for the poor.

MEYER, Heinrich August Wilhelm (1800–73). A German Bible commentator. He was born at Gotha, studied theology at Jena, and held various pastoral charges. After 1841 he resided in Hanover as a member of the consistory. His fame rests upon his *Kritisch-exegetisches Kommentar zum neuen Testament*, in some respects the greatest modern biblical commentary, of which the first volume, containing the first three Gospels, appeared in 1832. It was completed in 1859, though some of the later volumes were done by others. An English translation appeared at Edinburgh, with the exception of the *Revelation* (20 vols., 1873–82), and an American in New York (11 vols., 1884–88). More recently German revisions by later scholars have been published.

MEYER, Henry Herman (1874–). An American Methodist Episcopal clergyman and editor, born at Champaign, Ill. He attended the California State Normal School; graduated from German Wallace College (Ohio) in 1900 and from Drew Theological Seminary in 1903; and later was a graduate student at Columbia University and at Jena. For several years before being ordained in 1900 he had held various pastorates; he was then for a year a professor in St. Paul's College (Minnesota). In 1903 he became assistant editor of the Sunday-school publications of the Methodist Episcopal church, and after the death of the editor in chief, J. T. Macfarland, he was elected to succeed him (1914). In 1911 he served as secretary of the Sunday School Council of the United States and Canada, and he became a member of the executive council of the Religious Education Association. He edited the *Lesson Handbook* after 1904, and is author of *Stencil Maps and Missionary Chalk Talks* (1904) and *The Graded Sunday School in Principle and Practice* (1910).

MEYER, Hugo Richard (1866–). An American economist. He was born in Cincinnati, Ohio, and was educated at Harvard University (A.B., 1892; A.M., 1894), where he was an instructor in political economy from 1897 to 1903. He served as assistant professor of political economy at the University of Chicago in 1904–05 and after 1907 spent considerable time in travel. He is author of *Government Regulation of Railway Rates* (1905); *Municipal Ownership in Great Britain* (1906); *The British State Telegraphs* (1907); *Public Ownership and the Telephone in Great Britain* (1907).

MEYER, Johann Georg (Meyer von Bremen) (1813–86). A German genre painter, born at Bremen. He was a pupil at Düsseldorf of Sohn and Schadow and at first painted biblical subjects, but after 1842 practiced genre painting. His favorite subjects were peasants of the Hessian, Bavarian, and Swiss mountain districts. Among his early works were "The Anniversary of the Hessian Parson" (1842) and "The Penitent Daughter" (1852), Bremen Gallery. His scenes from child life followed after he settled in Berlin in 1852. These include: "Girl Telling Fairy Tales," "Blindman's Buff," "The Youngest Brother," and the "Little Mother" (1852), National Gallery, Berlin. He also painted single or group figures of young girls, like his "Awaiting," "The Courting," and "Reading the Love Letter." The Metropolitan Museum of New York possesses "The Letter" (1873). Meyer's pictures are often naïve and full of humor, but lack sound pictorial qualities, and are illustrations rather than paintings. He was a professor at the Berlin Academy and received a medal in Philadelphia in 1876.

MEYER, Jürgen Bona (1829–97). A German philosophical writer and follower of Kant. He was born at Hamburg and studied science and philosophy in Berlin and Bonn. In 1862 he was admitted as privatdocent to the philosophical faculty at Berlin University and in 1868 he became professor of philosophy at Bonn. From 1889 to 1892 he was editor of the *Deutsche Zeit- und Streitfragen*, and from 1893 to 1896 of the *Vereinsblatt des liberalen Schulvereins Rheinlands und Westfalens*, both social-political journals. In these most of his later essays appeared. He published: *Aristoteles Thierkunde* (1855); *Voltaire und Rousseau in ihrer socialen Bedeutung* (1856); *Zum Streit über Leib und Seele* (1856); *Grundzüge der Schulreform unserer Zeit* (1861); *Religionsbekenntniss und Schule* (1861); *Kants Psychologie* (1869); *Philosophische Zeitfragen* (1870; 2d ed., 1874); *Leitfaden zur Geschichte der Philosophie* (1882); *Probleme der Lebensweisheit* (1887).

MEYER, Konrad Ferdinand (1825–98). A Swiss poet and historical novelist. He was born in Zurich, the son of the historian and official F. Meyer, spent a part of his youth in the French cantons, where he learned the language. He studied law in Zurich and then devoted some years to the private study of history. After visiting Paris in 1857 and Rome in 1858, he settled permanently in Kilchberg, near Zurich. The little volume of 20 historical *Balladen* (Leipzig, 1864), by which he first attracted attention, is halting in expression, as are the verses of *Romanzen und Bilder* (Leipzig, 1870). More plasticity appears in *Huttens letzte Tage* (Leipzig, 1871; 50th ed., 1911) and in *Engelberg* (ib., 1873), both narrative poems of power. Meyer then turned his attention from verse to prose, still remaining faithful to historical themes, and produced six striking epic narratives, which, though they require in the reader too wide a culture to be popular, are an endur-

ing part of German novelistic literature. These are: *Jürg Jenatsch* (1876; 117th ed., 1912); *Der Heilige* (1880; 63d ed., 1912); *Leiden eines Knaben* (1883); *Die Hochzeit des Mönchs* (1884); *Die Versuchung des Pescara* (1887; 43d ed., 1912); *Angela Borgia* (1891). Meantime he had written a remarkable group of historical short stories, first collected as *Kleine Novellen* (1883) and later as *Novellen* (50th ed., 1912). Characteristic and perhaps best of these is *Gustav Adolfs Page*. His early poems are incorporated, with many changes, almost always for the better, in *Gedichte* (1882; 59th ed., 1912). Meyer's literary characteristics, which combine to make him the most important imaginative writer in Switzerland in his generation, are truthfulness of observation, a realistic plasticity in description, clearness of style, objectivity in statement. A uniform edition of Meyer's works appeared in 1892; his collected works in eight volumes (Leipzig, 1912). For his biography, consult Trog (Basel, 1897) and Frey (Stuttgart, 1900; 2d ed., 1909); also Moser, *Wandlungen der Gedichte K. F. Meyers* (Leipzig, 1900); Kraeger, *K. F. Meyer, Quellen und Wandlungen seiner Gedichte* (Berlin, 1901); A. Stern, *Studien zur Litteratur der Gegenwart*, vol. ii (Dresden, 1904); H. Stichelberger, *Die Kunstmittel in Meyers Novellen* (Burgdorf, 1907); M. L. Taylor, *A Study of the Technique of C. F. Meyer's Novellen* (Chicago, 1909); E. Korrodi, *Conrad F. Meyer* (Leipzig, 1911).

MEYER, Kuno (1858–1919). A German scholar, distinguished in the field of Celtic literature, born at Hamburg and educated in the schools of that city and at the University of Leipzig. At first devoting himself to Germanic and Celtic philology, he eventually made Celtic philology the centre of his studies. An appointment (1884) as lecturer in Teutonic languages at University College, Liverpool, was followed by an appointment as professor in the same institution 10 years later, and in 1911 he accepted the chair of Celtic at Berlin. He founded the *Zeitschrift für celtische Philologie* in 1895, and, with Whitley Stokes, the *Archiv für celtische Lexicographie* three years later. In 1903, with John Strachan, he founded the Summer School of Irish Learning, Dublin, the purpose of which was the promotion of the study of the old Irish language and literature. His scholarly enthusiasm was an inspiration to the leaders of the Gaelic League, which sought to make Irish the spoken language of Ireland, and a help to the translators and poets of the Irish literary revival of the 1890's. His contributions to Celtic scholarship have been important and original. The Irish recognized his services to them by making him an honorary freeman and burgess of the cities of Dublin and Cork, but Dublin withdrew the freedom of the city in 1915 because of several pro-German war-time addresses made by Meyer in the United States. An invitation to lecture at Harvard in the same year he first accepted and later declined, incensed at what he considered the unneutral attitude of the university. Honorary degrees (D.Litt.) came to him from the University of Wales, from Oxford, and from St. Andrews. Among his publications are: *The Irish Odyssey* (1885); *The Vision of MacConglinne* (1892); *The Voyage of Bran* (1894), with A. Nutt; *King and Hermit* (1901); *Early Relations of the Brython and Gael* (1896); *Selections from Ancient Irish Poetry* (1911); *Sanas Cormaic, an Old Irish Glossary* (1912); *Learning in Ireland in the Fifth Century* (1913); *Ueber die älteste irische Dichtung* (1914). In 1912 a volume of *Miscellany* was presented to him by pupils and friends in honor of his election to the chair of Celtic at the University of Berlin.

MEYER, Leo (1830–1910). A German philologist, born at Bledeln, near Hanover, and educated at Göttingen and Berlin. From 1862 to 1865 he was professor in Göttingen, and in 1865 he became professor of comparative philology at Dorpat. In 1889 he again accepted a chair at Göttingen. His contributions to philological literature, works of great merit, include: *Vergleichende Grammatik der griechischen und lateinischen Sprache* (1861–65); *Die gothische Sprache* (1869); *Handbuch der griechischen Etymologie* (1901). He also wrote *Glauben und Wissen* (1876) and *Ueber das Leben nach dem Tode* (1882).

MEYER, Lothar Julius (1830–95). A German chemist, born in Varel, Oldenburg. He studied medicine in Zurich and Würzburg and chemistry and physics at Heidelberg, where, in 1857, he made the discovery that the taking up of oxygen by the blood takes place through the chemical affinity between oxygen and the coloring matter of the blood. This view, published in *Die Gase des Blutes* (1857), was supplemented by the study *De Sanguine Oxydo Carbonico Infecto* (1858). In 1859 he became professor at Breslau, in 1866 at Eberswalde, and in 1868 at Karlsruhe, whence in 1876 he went to Tübingen. Meyer also wrote: *Die modernen Theorien der Chemie* (1864; 6th ed., partially, 1896); *Die Atomgewichte der Elemente* (1883), with Seubert; *Grundzüge der theoretischen Chemie* (3d ed., 1902). But he is best known as one of the discoverers of the Periodic Law (q.v.), for which achievement he received the Davy medal of the Royal Society in 1882.

MEYER, mâ'yâr', Paul (1840–). A French philologist, born in Paris on Jan. 17, 1840. He studied at the Ecole des Chartes; served in the manuscript department at the Bibliothèque Nationale (1863–65); and was keeper of the national archives from 1866 to 1872. In 1865 he founded the *Revue Critique*, of which he was joint editor until 1872, when, with Gaston Paris, he established *Romania*. Meyer became secretary of the Ecole des Chartes in 1872, was professor of the languages and literatures of southern Europe in the Collège de France from 1876 until 1906, and from 1882 was director of the Ecole des Chartes. He was elected to the Institute in 1883. His researches into the literature of the Middle Ages, which began with a study of that of Provence and was very comprehensive, involved laborious investigations in many libraries, particularly those of France and England. His works include: *Recherches sur les auteurs de la chanson de la croisade albigeoise* (1865); *Recherches sur l'épopée française* (1867); *Les derniers troubadours de la Provence* (1871; 2d ed., 1901); *Mémoire sur l'étude des dialectes de la langue d'oc au moyen âge* (1874); *Recueil d'anciens textes bas-latins, provençaux et français* (1874–77); *Alexandre le Grand dans la littérature française du moyen âge* (2 vols., 1886); *Nicole de Bozon* (1889); *Guillaume le Maréchal* (3 vols., 1891–1901); *L'Escoufle: roman d'aventure* (1894), with Michelaut; *Guillaume de la Barre: roman d'aventures par Arnaut Vidal de Castelnaudari* (1895); *Histoire des relations de la*

France avec Venise (1896); *L'Apocalypse en français au XIIIe siècle* (1901); *Pour la simplification de notre orthographe*, containing also the report of the commission on the simplification of French orthography (Paris, 1905); *Documents linguistiques du midi de la France* (1909), an important and extensive work. On account of ill health he resigned the editorship of *Romania*.

MEYER, mī'ĕr, VICTOR (1848–97). A German chemist, born in Berlin. He studied in Berlin and (under Bunsen) at Heidelberg and was appointed professor in the Stuttgart Polytechnikum in 1871 and in 1872 professor of chemistry and director of the chemical laboratory in the Polytechnic Institute of Zurich. In 1885 he became professor at Göttingen, and in 1889 he was called, as Bunsen's successor, to Heidelberg. He carried out a number of investigations in organic chemistry, among the results of which may be mentioned his discovery of thiophene and its derivatives. He also made important contributions to organic stereochemistry. But he is perhaps best known among chemists as the inventor of a practical method of determining the molecular weights of vaporizable substances—a method which is in almost constant use in chemical laboratories. (See MOLECULES—MOLECULAR WEIGHTS.) In addition to numerous contributions to the reports of the German Chemical Society he wrote: *Gutachten betreffend den Verkehr mit Petroleum und anderen feuergefährlichen Flüssigkeiten* (1879); *Probleme der Atomistik* (1896); and, jointly with Jacobson, a brilliant treatise on organic chemistry (vol. i, 1893). The treatise was completed after Victor Meyer's death.

MEYERBEER, mī'ĕr-bâr, GIACOMO (1791–1864). A famous German composer. He was born at Berlin, of wealthy Jewish parents, and gave early promise of musical talent, which his parents encouraged. Lauska, considered the best teacher in Berlin, superintended his studies, while Clementi took a special interest in his progress and instruction. He made his first public appearance as a boy of nine. In 1806 he became a student under Vogler and entered the latter's academy in Darmstadt, where he formed a friendship with Weber, which proved to be lifelong. Meyerbeer's earliest compositions gave little indication of the success he afterward achieved, and in style were largely ecclesiastical. An opera, *Jephthah's Vow*, dating from this period, is singularly dull and heavy. *Abimelek* (1813) was a comic opera which met with a more favorable reception than any of his previous efforts, and was especially fateful in that it took its composer to Vienna, where he first heard Hummel, whose virtuosity on the piano so impressed him that he postponed all his plans and went into retirement with the object of perfecting his own style. After a brief stay in Paris he went to Venice (1815) and attempted to duplicate Rossini's success with a series of operas in the Italian vein: *Romilda e Costanza* (1815); *Semiramide riconosciuta* (1819); *Emma di Resburgo* (1819); *Margherita d'Angiù* (1820); *L'esule di Granata* (1822); *Il crociato in Egitto* (1824), which latter made a tremendous success. In none of these operas is there the faintest trace of his German training. An attempt to win German favor with the last-named opera proved a failure, as did a similar attempt in Paris. From 1826 to 1831 little was heard of him publicly, but apparently the time was not wasted. According to Mendel he was devoting himself to the study of the French style, and particularly French opera. His father's death and the subsequent death of two of his children weighed upon him, for he was a man of strong family attachments. He resolved to expatriate himself from Germany and at the same time to desert the Italian for the French style of composition. *Robert le Diable* (1831) and *Les Huguenots* (1836) were the first fruits of his French studies—operas so intimately descriptive of French history and customs as to appeal irresistibly to the French public. Their success was immediate, so much so that, despite the determined opposition of the German classicists, *Robert le Diable*, *Les Huguenots*, *Le Prophète*, and *Dinorah* were all successfully given in Germany. His success in both France and Germany caused the Prussian government to invite him to Berlin, where, in 1842, he was made Royal Music Director. Although not a great orchestral leader, he nevertheless accomplished important results during his stay in Berlin. *Das Feldlager in Schlesien* belongs to this period and had moderate success, as did *Struensee*, a scarcely known work. In 1849 he returned to Paris, where *Le Prophète* was performed with remarkable success. His last opera, *L'Africaine*, on which he had worked on and off for over 30 years, was finished only shortly before his death, which occurred at Paris, May 2, 1864. It was first produced at the Grand Opéra in 1865. Besides these operas he wrote an oratorio, *Gott und die Natur* (1811), a number of cantatas, and some instrumental music. Meyerbeer's importance rests entirely upon his operas. For many years after the composer's death *Robert*, *Les Huguenots*, *Le Prophète*, and *L'Africaine* maintained their popularity, but even before the end of the last century there were unmistakable signs that even these four were rapidly declining. It is not a mere coincidence that in direct proportion as Wagner gained ground Meyerbeer lost it. Throughout his life Meyerbeer strove for only one object—success. He won it by carefully studying the public taste of his time and sacrificing art to the prevailing fashion. It cannot be denied that he was a musician of eminent gifts and a master of technic and form, but he lacked noble ideals and strong artistic convictions. Even a superficial study of Meyerbeer's orchestration must convince the student that it was not the dramatic situation so much as the effect upon the audience that far too often determined the choice of instruments. Hence his frequent juxtaposition of violent dynamic contrasts without inner necessity. His melodies almost always lack distinction and not infrequently sink to the level of the trivial. As an artist Meyerbeer is the direct counterpart of Wagner, and one can accept only the one or the other. Consult: H. Blaze de Bury, *Meyerbeer, sa vie, ses œuvres, et son temps* (Paris, 1865); A. Kohut, *Meyerbeer* (Leipzig, 1890); H. de Curzon, *Meyerbeer: biographie critique* (Paris, 1910); H. Eymieu, *L'Œuvre de Meyerbeer* (ib., 1910); A. Hervey, *Meyerbeer* (London, 1913).

MEYERHEIM, mī'ĕr-hīm, FRIEDRICH EDUARD (1808–79). A German genre painter. He was born at Danzig, and studied under his father, and at the Berlin Academy, under Schadow. He was the first to introduce rustic genre scenes into Germany. His subjects are usually good-humored, idyllic, and somewhat sentimental inter-

pretations of the lives of the peasants of the Harz Mountains, Thuringia, and north Germany, and are smoothly and clearly painted. He became a member of the Berlin Academy in 1838 and professor in 1850. Among his works are: "Altenburgers in the Field" (1838); "The King of the Shooting Match" (1836), "Tid-Bit" (1852), both in the National Gallery, Berlin; "Domestic Happiness" (1847), "Going to Church," and "Good Morning, Dear Father!" (1858), all in the Ravené Gallery, Berlin.

MEYERHEIM, Paul (1842–1915). A German painter, born in Berlin, son and pupil of Friedrich Eduard Meyerheim. He also studied at the Berlin Academy, and traveled and studied in Germany, the Tirol, the Netherlands, and Paris. His later travels were extensive. Although he won distinction in genre, landscape, and portraiture, and as a decorative artist, his fame rests chiefly on his masterly and usually humorous rendering of the animal world. His management of light and shade is admirable, and an idea of his versatility may be gained from the following list of works: "An Amsterdam Antiquary" (1869), "Menagerie" (1885), both in the National Gallery, Berlin, the staircase of which he adorned with a charming frieze in fresco, allegorizing "The Four Seasons" (1883) in the life of birds; "The Life-Course of a Locomotive" (1878), in the Villa Borsig, Berlin; "Sheep-Shearing" (1872); "The Young Lions"; "The Card Sharpers" (monkeys, 1882); "Monkeys in a Studio," and, out of many fine landscapes, a "Charcoal Pit in the Bavarian Alps" (1887, Hamburg Gallery) and "Burning Windmill" (1903). Of numerous excellent portraits those of his father and of Daniel Chodowiecki (1887), both in the Museum at Danzig, are representative examples. He received great gold medals at Berlin (1872) and Munich (1888), and gold medals at Paris, Philadelphia, and Chicago. Consult Meissner, in the *Art Journal* (London, 1895).

MEYER-HELMUND, mī′ĕr-hĕl′mŭnt, Erik (1861–). A Russian-German composer, born in St. Petersburg. He received the rudiments of musical instruction from his father and afterward went to Berlin, where he studied under Kiel and Stockhausen. He became famous in Germany as a song composer, and for many of his songs he himself wrote the words. All his music is marked by strong local color and a distinct individuality. His larger works include the operas *Margitta* (1889); *Die beiden Klingsberg, Der Liebeskampf* (1893); *Heine's Traumbilder* (1908); and the ballet music *Der Berggeist* (1893), followed one year later by the burlesque opera *Trischka.*

MEYER-LÜBKE, lŭp′ke, Wilhelm (1861–). A Romance philologist, born at Dübendorf in the Canton of Zurich, Switzerland. From 1879 to 1883 he studied at Zurich and Berlin, coming under the influence of Adolf Tobler (q.v.). In 1887 he became professor extraordinary at Jena, and in 1890 was made full professor of Romance philology at Vienna. In 1906–07 he was rector of the university. His works include *Die Schicksale des lateinischen Neutrums im Romanischen* (1883) and the *Grammatik der romanischen Sprachen* (4 vols., 1890–1902), translated as *Grammaire des langues romaines* (4 vols., 1890–1905). This is the most important grammar of the Romance languages since that of Diez. Other books are the *Italienische Grammatik* (1891), the *Einführung in das Studium der romanischen Sprachwissenschaft* (1901; 2d ed., 1909), of which a good Spanish translation, revised by the author, was made by Castro, under the title *Introducción al estudio de la linguistica romance* (Madrid, 1914); *Romanische Namenstudien* (1905); *Die Ziele der romanischen Sprachwissenschaft* (1906); *Historische Grammatik der französischen Sprache* (1908; 3d ed., 1913); *Romanisches etymologisches Wörterbuch* (1911 et seq.); *Prinzipienfragen der romanischen Sprachwissenschaft* (1910); and numerous articles in the *Zeitschrift für romanischen Philologie.*

MEY′ERSDALE. A borough in Somerset Co., Pa., on Casselman River, 113 miles by rail southeast of Pittsburgh, on the Baltimore and Ohio and the Western Maryland railroads (Map: Pennsylvania, C 8). Its chief industry is the mining of coal, and there are brickkilns, shirt, washing-machine, and maple-sugar factories, planing mills, machine works, cigar factories, etc. Meyersdale was first settled as early as 1776, but the growth of the town dates from the advent of the first railroad in 1871. Coal mining was begun in the following year. Pop., 1900, 3024; 1910, 3741.

MEYNELL, mĕn′nĕl, Alice (Christiana) (c.1853–1922). An English poet and essayist, born in London, a daughter of Thomas J. Thompson, an intimate friend of Charles Dickens. With her elder sister, Elizabeth (Lady Butler, well known for "The Roll Call" and other military paintings), she was educated by her father. The Thompsons lived much abroad, especially in Italy. While a girl, Miss Thompson went over to the Church of Rome and was followed by other members of the family. In 1877 she married Wilfrid Meynell (q.v.). Her first poems, *Preludes* (1875; new ed., 1893), were warmly praised by Ruskin, Rossetti, and Browning. In 1901 she collected in a volume called *Later Poems* a group of short lyrics. Soon after her marriage, Mrs. Meynell began to contribute to the London periodicals, gaining wide recognition for her graceful and delicate style. She published several delightful volumes of essays, as *The Rhythm of Life* (1893); *The Colour of Life* (1896); *The Spirit of Place* (1898). Among her other publications are: *The Flower of the Mind* (1897), an anthology of English poetry; *John Ruskin* (1900); *Ceres Runaway* (1910); *Mary, Mother of Jesus* (1912); *Collected Poems* (1913); *Essays* (1914). Consult William Archer's chapter on her in his *Poets of the Younger Generation* (New York, 1902).

MEYNELL, Wilfrid (1852–). An English author and journalist of Yorkshire descent, educated privately at York. He was for many years a journalist and was long editor of the *Weekly Register.* To reviews and periodicals, notably to the *Contemporary Review,* the *Athenæum,* and the *Saturday Review,* he was a frequent contributor. In 1877 he married Alice Thompson. (See Meynell, Alice.) His writings include: *Journals and Journalism* by "John Oldcastle" (2d ed., 1880); *Benjamin Disraeli: An Unconventional Biography* (2 vols., 1903); *Collected Poems* (1913); *Johnson* (1913). He edited *Selections from Newman* (1907) and the *Works of Francis Thompson* (3 vols., 1913), and wrote a biographical sketch of Thompson for the fifth edition of the latter's *Selected Poems* (1909).

MEYNERT, mī′nĕrt, Theodor (1833–92). An Austrian neurologist, born at Dresden. He

was educated at the University of Vienna; in 1865 was appointed lecturer on anatomy at the university; in 1866 was prosector in the Vienna insane asylum; and in 1870 professor of psychiatry. He was a member of the Vienna Academy of Sciences. A member of the staff of the *Psychiatrisches Centralblatt* in 1871–78, he also published several volumes, including *Zur Mechanik des Gehirnbaues* (1874), *Psychiatrie: Klinik der Erkrankungen des Vorderhirns, etc.* (1884), and *Klinische Vorlesungen über Psychiatrie* (1890).

MEYR, mīr, Melchior (1810–71). A German poet and novelist, born at Ehringen, near Nördlingen. He was educated at Munich and Heidelberg. His most important works are: *Erzählungen aus dem Ries* (4th ed., 1892), his best work; his *Gedichte* (1857); the long political novel *Vier Deutsche* (1861); the tragedies *Karl der Kühne* (1862) and *Herzog Albrecht* (1862); and the anonymous and extremely clever *Gespräche mit einem Grobian* (1866). He also wrote the philosophical *Religion des Geistes* (1871). Consult Bothmer and Carriere, *Melchior Meyr: Biographie, Briefe und Gedichte* (Leipzig, 1874).

MEYRICK, mĕr′rĭk, Frederick (1827–1905). A Church of England scholar. He was born at Ramsbury vicarage, Wiltshire; was educated at Trinity College, Oxford, of which he was scholar, fellow, and tutor; and held the university offices of select preacher and public examiner. In 1856 he was appointed one of the Queen's Whitehall preachers, in 1859 inspector of schools, and from 1868 to his death was rector of Blickling, Norfolk, and from 1869 nonresidentiary canon of Lincoln. He was the chief agent in establishing the Anglo-Continental society for making known the principles of the English church in foreign countries, and wrote much for that purpose. He traveled widely on the Continent, and in 1886–87 was principal of Coddington College, Barbados. He was the author of *The Moral and Devotional Theology of the Church of Rome, According to the Authoritative Teaching of S. Alphonso de' Liguori* (1856); *The Outcasts and Poor of London* (1858); *On Dr. Newman's Rejection of Liguori's Doctrine of Equivocation* (1864); *Is Dogma a Necessity?* (1883); *The Doctrine of the Church of England in the Holy Communion* (1883; 4th ed., 1889); *The History of the Church of Spain* (1892); *Justin Martyr* (1896); *Scriptural and Catholic Truth and Worship* (1901; 2d ed., 1908); *Appeal to the Primitive Centuries* (1904); *Appeal to the Sixteenth and Seventeenth Centuries* (1905).

MEYRICK, Sir Samuel Rush (1783–1848). An English antiquary. He graduated from Oxford University as B.A. in 1804, took several later degrees, and practiced law in the ecclesiastical and admiralty courts. He possessed a very fine collection of armor, and his *Critical Inquiry into Ancient Armour* (splendidly illustrated, 3 vols., 1824; 2d ed., 1844) is still considered authoritative. He assisted Rev. T. D. Fosbrooke in 1823–25 in the publication of the *Encyclopædia of Antiquities.* In 1826 he arranged the arms and armor in the Tower of London, and in 1828 performed the same service at Windsor Castle. During his administration of the office of high sheriff of Herefordshire in 1834 he revived some of the old ceremonial display, including javelin men in full accoutrement. He published also *History and Antiquities of the County of Cardigan* (1810; reprinted, 1907) and an edition of Lewis Dunn's *Heraldic Visitations of Wales* (2 vols., 1846).

MEYWAR. See Udaipur.

MEZEN, mȧ-zĕn′y′, or **MESEN.** A river of north Russia. It rises near the north boundary of the Government of Vologda and flows northwest through the Government of Archangel, entering the White Sea at the Gulf of Mezen after a course of about 510 miles (Map: Russia, G 1). It is navigable in its lower part, but is free from ice only about six months in the year.

MÉZERAY, mȧz′rȧ′, François Eudes de (1610–83). A French historian and man of letters. He was born at Ruy, near Argenton, in the Department of Indre, studied at Caen, and after some military service in Flanders came to Paris and set to writing history. Richelieu patronized him and put him into the Academy. His *Histoire de France* (1643–51) brought him fame and is still of considerable value. During the Fronde he was an active pamphleteer against Cardinal Mazarin.

MEZE′REON (Fr. *mézéréon,* Sp. *mezeron,* from Ar. *mēzariyim,* camellia). The bark of *Daphne mezereum, Daphne gnidum,* and *Daphne laureola* of the family Thymelæaceæ, three shrubs from 2 to 4 feet high. *Daphne mezereum* has rose-red or purple, fragrant flowers, in small clusters, preceding the deciduous leaves. It is indigenous to hilly and mountainous regions of Europe, extending to the Arctic circle and eastward to Siberia, and is cultivated in the United States and established in some localities. The other two species grow in southern Europe. *Daphne laureola,* spurge laurel, has large evergreen leaves and yellowish-green flowers in axillary clusters. *Daphne gnidum,* spurge flax, has narrow, deciduous leaves and small white flowers in terminal racemes. Formerly the bark was extensively employed in medicine. The dried bark is inodorous, but has a persistently acrid and burning taste. The bark of *Daphne gnidum* is darker and that of *Daphne laureola* is more gray and has a greenish cast. They resemble mezereon in acridity. The root bark of the three species is the strongest, but the stem bark is the more common. It is used as an adjunct to sarsaparilla in making the compound decoction and the compound extract of that drug. The juice of the fresh bark is irritant and is said to blister the skin. See Daphne.

ME′ZES, Sidney Edward (1863–). An American college president. He was born at Beloment, Cal., and was educated at the University of California (S.B., 1884) and at Harvard University (A.B., 1890; A.M., 1891; Ph.D., 1893). He was adjunct professor of philosophy (1894–97), associate professor (1897–1900), professor (1900–08), dean (1902–08), and president (1908–14) at the University of Texas. In 1914 he became president of the College of the City of New York. He received the honorary degree of LL.D. from Southwestern University in 1912 and from the University of California in 1913. He is coauthor of *The Conception of God* (1897) and author of *Ethics, Descriptive and Explanatory* (1901) and articles in reviews on education, ethics, and philosophy.

MEZHIRETCHIE, mĕ′zhĕ-rĕ′chyĕ. A town in the Government of Siedlce, Russian Poland, about 80 miles from Siedlce. It has several educational institutions, manufactures leather, brass articles, etc., and had a population in 1910 of over 14,000, largely Jews.

MÉZIÈRES, mā′zyâr′. The capital of the Department of Ardennes, France, at the confluence of the Meuse and Vence, 55 miles northeast of Rheims (Map: France, N., K 3). It is situated in a bend of the river, with the towns of Charleville, Arches, Pierre, and Mohon immediately about it. The sixteenth-century parish church was the scene of the marriage of Charles IX to Elizabeth of Austria in 1570. The town manufactures ammunition and has iron and copper foundries, but most of its iron industry has been transferred to Charleville, with which it is connected by a suspension bridge. It also manufactures dyes. In 1521 the Chevalier Bayard, with 2000 men, successfully defended the place against 40,000 Spaniards under Charles V. In 1815 the town held out for six weeks against the allies, who besieged it after the battle of Waterloo. In the Franco-German War of 1870–71 Mézières capitulated after a cannonade of two days. Its fortifications were razed in 1886. Mézières was the scene of extremely heavy fighting between the Germans and the allies during the European War which broke out in 1914. See WAR IN EUROPE. Pop. (commune), 1901, 7884; 1911, 10,403.

MÉZIÈRES, ALFRED JEAN FRANÇOIS (1826–1915). A French literary critic, born at Rehon (Moselle). Educated at the lyceum at Metz and the French school at Athens, he participated in the revolution of 1848 as captain. After 1885 he was president of the journalistic association of Paris. He became professor of foreign literature at Toulouse (1853), Nancy (1854), and Paris (Sorbonne, 1863); was admitted to the Academy in 1874; and was elected deputy (1881) and Senator (1900). His publications are mainly literary studies. Among them are: *Mémoire sur le Pélion et l'Ossa* (1853); *Shakespeare, ses œuvres et ses critiques* (1861); *Prédécesseurs et contemporains de Shakespeare* (1863); *Contemporains et successeurs de Shakespeare* (1864); *Dante et l'Italie nouvelle* (1865); *Pétrarque* (1867), crowned by the Academy in 1868; *Goethe, les œuvres expliquées par la vie* (1872–73). His *En France* (1883), *Hors de France* (1883), *Mirabeau* (1891), are of political stamp. Later works include: *Pétrarque* (1895), crowned by the Academy; *Morts et vivants* (1897); *Au temps passé* (1906); *Silhouettes de soldats* (1907); *Hommes et femmes d'hier et d'avant hier* (1907); *De tout un peu* (1909); *Pages d'automne* (1911); *Ultima verba* (1914). The *Revue des Deux Mondes* and the *Temps* published many of Mézières' articles.

MÉZIÈRES, MARIE JEANNE LABORAS DE. A French novelist. See RICCOBONI, MARIE J. L. DE.

MÉZIÈRES, PHILIPPE DE (1327–1405). "The old pilgrim," as he called himself, was born at Mézières in Picardy, the youngest of 12 children. He was educated at Amiens. When about 18 years old he took part in the war in Lombardy, and after that, for a time was in the service of Andrew, King of Naples. In 1346 he took the cross and fought at Smyrna, after which he received the honor of knighthood. All the rest of his life was devoted to the cause of the crusades against the Mohammedans. In 1347 he made a pilgrimage to Jerusalem. On his return he stopped at Cyprus and entered the service of Peter of Lusignan. After the latter became King of Cyprus Philippe was his chancellor and accompanied him on his travels in Europe to kindle zeal for a crusade, and on his expedition against Alexandria. After the capture of this city in 1365 one-third of it was given to Philippe as a foundation for the Knights of the Passion of Jesus Christ, an order which he planned. The city was soon lost and the order was never founded, although it was the lifelong desire of Philippe, who dreamed of a knighthood of 100,000 men devoted to the service of the Holy Land. The members were to take most of the monastic vows, but were to marry in order to have sons to continue their work. After the death of Peter, Philippe returned to the west and in 1372 induced the Pope to adopt for the West the Festival of the Presentation of the Virgin, for which he translated the Greek office. In 1373 he went to Paris and became a councilor of Charles V, from whom he received a pension, and a little later became the preceptor of the Dauphin. In 1380, after the death of Charles V, he retired to the convent of the Célestines at Paris, and thereafter devoted himself to writing in favor of a new crusade. He was one of the most original thinkers of the fourteenth century and his writings are important for the history of France. A full list of them and a lengthy analysis of each are given by Jorga. Among them may be noted a life of his friend and colaborer, Peter Thomas, and the *Songe du vieil pèlerin,* which is a project for a new crusade. He labored by his writings to bring about peace between France and England, in order to make the conditions more favorable for a crusade. He died in the convent on May 29, 1405. Consult: article by Jorga on the letters of Philippe, in *Revue Historique* (Paris, 1892); Nicolas Jorga, *Philippe de Mézières et la croisade au XIVe siècle* (ib., 1896)—this study supersedes all previous works and renders it unnecessary to quote any of the numerous books which had been written about Philippe; Auguste Molinier, *Les sources de l'histoire de France,* vol. iv (ib., 1904); Louis Bréhier, *L'Eglise et l'Orient au moyen âge* (ib., 1907).

MÉZIRIAC, mā′zē′rē′āk′, SIEUR DE. See BACHET, C. G.

MEZÖTÚR, mĕ′zē-tōōr. A town in the County of Jasz-Nagykun-Szolnok, Hungary, situated on an affluent of the Köros, 80 miles east-southeast of Budapest (Map: Hungary, G 3). It has a Gymnasium and trades in cereals, wine, horses, and cattle. It has large pottery factories. Pop., 1900, 25,383; 1910, 25,835, mostly Magyars.

MEZ′ZANINE (Fr. *mezzanine,* It. *mezzanino,* from *mezzano,* middle, from *mezzo,* middle, half). An intermediate subordinate story between two main stories; especially, in its strictest sense, such a story interpolated into the upper part of a lofty main story. An intermediate story thus introduced between the ground story and the *premier étage* is called in French the *entresol.* In many European palaces and public buildings accommodations for servants and lodgers have been provided by mezzanines which formed no part of the original design.

MEZZO, mĕd′zō (It., middle). A term generally used in music in conjunction with some other word, as mezzo forte, moderately loud; mezzo piano, rather soft; mezza voce, with a moderate strength of tone; mezzo orchestra, with half the orchestra; etc. When written alone and applied to the grand pianoforte it indicates that the soft pedal is to be used. Mezzo-soprano

means a voice lying halfway between the high soprano and contralto.

MEZZOFANTI, měd′zō-fän′tē, Giuseppe (1774–1849). An Italian linguist and a cardinal in the Church of Rome. He was born in Bologna, was educated there, and became a priest in 1797 and, in the same year, professor of Hebrew at the university. When the Cisalpine Republic was established he refused to take the oath of allegiance and lost his chair, but was reinstated in 1803 and became university librarian in 1815. In 1831 he went to Rome, where he was appointed librarian of the Vatican and secretary of the College of the Propaganda (1833), and in 1838 was raised to the rank of Cardinal. He acquired a European reputation by his linguistic attainments, and at the time of his death was credited with knowing at least 58 languages. Consult Russell's *Life of Cardinal Mezzofanti* (London, 1858) and the biographies by Manavit (Paris, 1853), Bellesheim (Würzburg, 1880), and Mitterrutzner (Brixen, 1885).

MEZZOTINT, měd′zō-tint *or* měz′ō- (It. *mezzotinto,* half colored). A method of engraving on a copper or steel plate, which is prepared by making on it a ground with an instrument called a cradle or rocker. This instrument is a flat plate of hardened steel, of which one side is brought to a segment of a circle with a sharp cutting edge, the bevel of which, engraved with fine parallel lines, resembles a file, and the edge itself is brought to a ridge of very fine points. This has to be rocked across the plate many times, in various directions, until the whole surface is reduced to a close-set mass of small teeth or points. The plate thus pricked offers a uniformly roughened surface, upon which the engraver begins his proper work. Now, this prepared plate, if inked and printed from, would yield an entirely black impression; so it is the business of the engraver to work from dark to light, or from black to white. This he does with various instruments, such as the scraper, employed to diminish the burr and such asperity of surface as tends to retain too much ink, and the burnisher, to remove all surface roughness when the highest light or pure white is required in the picture he is producing.

Mezzotint is admirably adapted to the reproduction of those works in which broad effects of light and shade are dominant, as opposed to those where close line, contour, and small detail are demanded. Mezzotint has another limitation—its failure to bear much printing. The burr is soon destroyed in the copper plates, and, although steel is more enduring, mezzotint on this medium is still far behind line engraving in reproductive possibilities. From 25 to 30 impressions of the first class are all that may be drawn from copper plates. The original inventor or discoverer of mezzotint engraving was Louis von Siegen, a lieutenant colonel in the service of the Landgrave of Hesse-Cassel, and his first published work was a portrait of the Princess Amelia Elizabeth of Hesse, dated 1642, 15 years anterior to the earliest date on the plates of Prince Rupert, to whom a charming legend ascribes the invention of the art.

The art is peculiarly identified with eighteenth-century Britain, among the greatest mezzotint engravers being James McArdell (died 1765), James Watson, J. Raphael Smith, and Valentine Green. In their work were mirrored the achievements of a national school of portraiture. The process served also for genre and sporting scenes, and later on for David Lucas's reproduction of Constable's landscapes and Turner's famous *Liber Studiorum.* In the United States the mezzotint style was a favorite with magazine publishers in the early days of magazines, being introduced from England by John Sartain (q.v.) in 1830. In recent years Arlent Edwards and others have reproduced paintings in mezzotints printed in color. Consult: P. G. Hamerton, *The Graphic Arts* (London, 1882); J. C. Smith, *British Mezzotint Portraits* (4 vols., ib., 1883); Hubert von Herkomer, *Etching and Mezzotint Engraving* (ib., 1892); A. Whitman, *Masters of Mezzotint* (ib., 1898); C. J. H. Davenport, *Mezzotints* (ib., 1904); Julius Leisching, *Schabkunst: ihre Technik und Geschichte in ihre Hauptwerken von XVII. zum XX. Jahrhundert* (Vienna, 1913). See Engraving.

MHOW, mou. A city and important British military station in the State of Indore, Central India Agency, 13 miles southwest of the town of Indore, near the Vindhya Mountains, on an eminence on the Gumber River 1800 feet above the sea (Map: India, C 4). On the southeast are the cantonments, arranged like a European town, having a spacious lecture room, a well-furnished library, three schools, and a theatre. They are occupied under the Mandsaur Treaty of 1818 by a considerable force of British and native troops. Pop., 1901, 36,039; 1911, 29,820.

MIAGAO, mē′ä-gä′ō. A town of Panay, Philippines, in the Province of Iloilo (Map: Philippine Islands, D 5). It is situated on the south coast of the island, 22 miles west of Iloilo. Pop., 1903, 20,656.

MIAKO, mē-ä′kō. A city of Japan. See Kyoto.

MIALL, mī′ąl, Edward (1809–81). An advocate of English church disestablishment. He was born in Portsmouth, England; studied at Wymondley Theological Institute, Hertfordshire; entered the Congregational ministry, and was installed pastor at Ware in 1831 and at Leicester in 1834. Becoming an active advocate of the disestablishment of the Church of England, he removed to London and established the *Nonconformist* newspaper as the organ of that policy in 1841. He represented Rochdale (1852–67) and Bradford (1869–74) in Parliament. He favored universal suffrage and opposed class legislation and compulsory religious education. He led in the establishment, in 1844, of the British Anti-State Church Association, which afterward became the Society for the Liberation of Religion from State Patronage and Control. In 1856 he introduced in the House of Commons a resolution on the disestablishment of the Irish church. His motion for a committee on the disestablishment of the English church was introduced three times in 1871 and 1872 and lost. He was appointed in 1858 a member of the Royal Commission on Education as a representative of the Nonconformists. Among his principal publications are: *Views of the Voluntary Principle* (1845); *Ethics of Nonconformity* (1848); *The British Churches in Relation to the British People* (1849); *The Franchise as a Means of a People's Training* (1851); *Title Deeds of the Church of England to her Parochial Endowments* (1862); *Social Influences of the State Church* (1867). Of less polemical character is *An Editor off the Line, or Wayside Musings and Reminiscences* (1865). A *Life* of Miall was published by his son, Arthur Miall (London, 1884).

MIAMI, mī-ä′mē. A town in Gila Co., Ariz.,

11 miles by rail from Globe, on the Arizona Eastern Railroad. It is in a rich copper district, the mining of which constitutes the town's sole industry. Water and electric power are derived from the Roosevelt Dam and Reservoir (see DAMS AND RESERVOIRS), which is 40 miles distant. Miami was incorporated in July, 1914. Pop., 1915 (local est.), 6500.

MIAMI, mī-ăm′ī. A city and the county seat of Dade Co., Fla., 366 miles south of Jacksonville, on the Florida East Coast Railway (Map: Florida, F 6). Trucking and fruit growing are the chief industries of the surrounding country, and large quantities of grapefruit, oranges, avocados, limes, and winter vegetables are shipped to northern markets. Miami on account of its remarkably equable climate is a popular winter resort, being situated on Biscayne Bay, one of the largest natural harbors on the east coast of Florida, and at the mouth of the Miami River, which is the eastern terminus of one of the large canals draining the Everglades. The winter homes of James Whitcomb Riley, William Jennings Bryan, and others of national prominence are situated here, and there are many hotels and boarding houses. Other noteworthy features are the courthouse and school buildings, a fine yacht club, and a bridge across the bay 2½ miles in length. Pop., 1900, 1681; 1910, 5471; local estimates place the population in 1915 as about three times that of 1910; 1920, 29,549.

MIAMI. A city and the county seat of Ottawa Co., Okla., 30 miles southwest of Joplin, Mo., on the St. Louis and San Francisco, the Missouri, Oklahoma, and Gulf, and the Oklahoma, Kansas, and Missouri Interurban railroads (Map: Oklahoma, G 2). Lead and zinc mining, lumbering, and the growing of cereals are the chief industries. The water works and electric-light plant are owned by the municipality. The commission form of government was adopted in 1909. Miami was the first town in the former Indian Territory to be built on land purchased and set apart for town purposes by the act of Congress. Pop., 1900, 1893; 1910, 2907.

MIAMI. An important Algonquian tribe residing, when first known to the French about 1660, in southeastern Wisconsin. They were somewhat superior to the northern tribes generally in their manner of living, and occupied a stockaded town with mat-covered houses. About the year 1690, in consequence of difficulties with the Illinois and Sioux, they removed to the southeast and established themselves on the site of what is now Chicago and upon the St. Joseph River of Michigan, whence they soon spread to the Wabash and Maumee and later to the Miami. Their principal band made headquarters at Kekionga, where Fort Wayne now stands, while others, settled lower down on the Wabash, developed later into two distinct tribes, known respectively as Wea and Piankishaw (q.v.). All three, however, continued until the end of the eighteenth century to regard themselves as one people, and first cousins of the Illinois, their western neighbors, whose language differed only dialectically from their own. In the Colonial wars the Miami sided alternately with either party, but joined Pontiac's alliance in 1764 and took sides against the Americans in the Revolution, continuing the struggle with the other tribes of the Ohio valley until their crushing defeat by General Wayne compelled them to make peace at the Greenville Treaty in 1795. The great chief, Little Turtle, who led the allied forces to victory against St. Clair and Harmar, was a Miami. Under Tecumseh they again joined the English side in the War of 1812. At its close, being now thoroughly broken, they began to sell their lands, and by 1827 had ceded almost the whole of their original territory and agreed to remove to Kansas. Here they rapidly died out from disease, famine, and dissipation, until about 1873 the remnant, only 150 in number, were placed upon the Quapaw reservation, in Oklahoma, where they number now 123. A considerable band had continued to occupy a reservation in Wabash Co., Ind., until 1872, when the land was divided and tribal relations dissolved. These now number about 90, practically all of mixed blood.

MIAMI, or **GREAT MIAMI, RIVER.** A river of western Ohio, formed by the confluence, in Logan County, of several small streams which rise in Auglaise and Hardin counties. It flows in a slightly southwesterly direction, joining the Ohio River at the Indiana State line (Map: Ohio, B 6). Its length is about 140 miles and its drainage area 5400 square miles, about two-thirds of its basin being within Ohio. Its more important tributaries are the Stillwater River and the Mad River, which join the main stream near Dayton, and the Whitewater, which comes in a few miles above its mouth. The sources of the river are at an elevation of about 1000 feet above sea level. The Miami and Erie Canal parallels the river from Hamilton to Piqua.

MIAMISBURG, mī-ăm′īz-bûrg. A village in Montgomery Co., Ohio, 46 miles north by east of Cincinnati, on the Great Miami River and the Miami and Erie Canal and on the Cleveland, Cincinnati, Chicago, and St. Louis, the Ohio Electric, and the Cincinnati, Hamilton, and Dayton railroads (Map: Ohio, B 6). It is an important industrial centre, the manufactures being favored by good water power, and including paper mills, carriage and buggy works, steel furniture, safe and tobacco factories, wheel works, etc.; and is also an important market for tobacco, which is cultivated extensively in the adjacent region. There is a Carnegie library. The water works and electric-light plant are owned by the municipality. Just outside of the corporate limits is the largest Indian mound in the State. A large part of the village was inundated in March, 1913, by the overflow of the river. The property damage amounted to about $1,500,000. Pop., 1900, 3941; 1910, 4271.

MIAMI UNIVERSITY. A coeducational institution of learning at Oxford, Ohio, founded in 1809. The first school was opened in 1816 and the university proper began its work in 1824. It has a college of liberal arts and a normal college. A considerable freedom is allowed in the election of studies. In 1914–15 the faculty numbered 51 and the attendance was 651. The library contained 47,000 volumes. The institution was endowed in 1809 with one township of land in Ohio, and receives financial aid from the State, the endowment amounting to $104,000 and the income to about $213,000. The college campus occupies about 114 acres. The grounds, buildings, and equipment were valued in 1914 at $835,000. The president in 1915 was Raymond M. Hughes, A.M.

MIANA (mī-ä′nȧ) **BUG.** See MITE.

MIANTONOMO, mī-ăn′tō-nō′mō. A Narragansett sachem, who succeeded his uncle, Ca-

nonicus, in 1636. He was on friendly terms with the early settlers of Massachusetts and assisted them during the Pequot War of 1637. In 1643 he conducted an unsuccessful expedition against Uncas, the Mohegan sachem, his bitter rival, with whom, however, he had agreed in 1638 not to open hostilities without first appealing to the whites. Being captured, he was handed over by Uncas to the Commissioners of the United Colonies, and was tried by an ecclesiastical court organized for the purpose, which condemned him to death and commissioned Uncas to carry out the sentence. A brother of the latter soon afterward killed the unsuspecting captive on the spot now called Sachem's Plain (near Norwich, Conn.), where he had originally been captured. A monument erected there in 1841 commemorates the event.

MIAO-TSE, mē-ä'ō-tsĕ, or **MIAU-TSI**, also known as MÁNS-TIERA, MÁNS-COC, and MEO. The inhabitants of the mountainous regions of southern China, in parts of the provinces of Hupeh, Szechuan, Yunnan, Kweichow, Hunan, Kwanghsi, and Kwangtung. They number several millions and represent an aboriginal population of this portion of the Celestial Empire driven back in recent times by the Chinese. Many of the Miao-tse tribes are under Chinese rule, but some of them still maintain their independence. The Miao-tse are shorter in stature than the northern Chinese, and apparently not Mongoloid in form and features. Consult: Edkins, *The Miautsi Tribes* (Foochow, 1870); Henry, *Lingnam* (London, 1886); Bourne, *Journey in Southwest China* (ib., 1888); A. H. Keaw, *Man: Past and Present* (Cambridge, 1900). See CHINA, *Ethnology*.

MIAOULIS. See MIAULIS.

MIAS. See ORANG-UTAN.

MIASMA mī-ăz'mȧ (Neo-Lat., from Gk. *μίασμα*, stain, from *μιαίνειν*, *miainein*, to pollute). A term formerly applied to any disease which was thought to arise from polluted air. Miasma has had slightly different meanings at different times, but has been most generally used to indicate certain imponderable morbific emanations from the soil of particular localities. Since the discovery of the specific plasmodium of malaria and its conveyance by the mosquito, the term "miasma" has lapsed into disuse and is now rarely seen in medical literature. See MALARIA AND MALARIAL FEVER; INSECTS, PROPAGATION OF DISEASE BY.

MIASSKY ZAVOD, mē-ȧs'kē zȧ-vôd'. A mining town in eastern Russia in the Government of Orenburg, situated among the Ural Mountains, 35 miles west of Cheliabinsk and near the railroad to that town. Its mines produce over 17,000 ounces of gold annually. Pop., 1897, 16,100; 1910, 25,479.

MIAULIS, mē-ou'lēs, ANDREAS VOKOS (c.1768–1835). A Greek admiral, born in the island of Negropont. Vokos, or Bokos, was his family name, the surname Miaulis being derived from the Turkish word for felucca. For long a merchant captain, he gave his services and his property heartily to the cause of the Greek revolution in 1821 and was put in command of the Greek fleet, consisting of a great number of small craft. In March, 1822, he defeated a Turkish squadron at Patras and in September another squadron near Spezzia. In 1825 he burned the fleet commanded by Ibrahim Pasha near Modon. In 1827, upon the appointment of the Englishman Lord Dundonald as his superior in command, he loyally continued to serve as a subordinate. He was restored to his old rank by President Capo d'Istria. He participated in the insurrection of 1831 and burned the fleet under his command at Poros, to keep it out of the hands of the Russians. He opposed the President's Russian policy and was actively engaged in the bitter controversies of the period. In 1832 the naval stations in the Archipelago were placed in his charge, and he served on the deputation sent to Munich to offer the crown to Prince Otho of Bavaria. In 1889 a monument was erected to him in Syra.

MIAU-TSI. See MIAO-TSE.

MIAVA, mē-ō'vŏ. A city of the County of Neutra, Hungary, on the Miava River, at the foot of the Little Carpathians, 56 miles northeast of Vienna (Map: Hungary, E 2). The manufacture of woolen and linen goods and bagging is the chief industry. Pop., 1900, 10,639; 1910, 10,063.

MI'CA (Neo-Lat., from Lat. *micare*, to flash; confused with and influenced by *mica*, crumb). A group of minerals that crystallize in the monoclinic system and consist essentially of aluminium silicate with varying proportions of potassium, sodium, lithium, iron, magnesium, etc. The different species are characterized by a basal cleavage, yielding thin, tough scales that are colorless to jet black. The principal members of the group include the following: *Muscovite*, or common mica, called also potassium mica, as it is essentially an aluminium and potassium silicate. The colorless varieties of muscovite are used in the doors of stoves and as lamp chimneys. It is also employed as an insulating material, in wall-paper manufacture, as a lubricant, and when ground it is used as an absorbent for glycerin in the manufacture of dynamite. During 1913, 1,700,677 pounds of sheet mica were mined in the United States. *Paragonite*, or sodium mica, is similar to the foregoing, except that the sodium replaces the potassium in its composition. It is of a yellowish to greenish color. *Lepidolite*, or lithium mica, is a potassium, lithium, aluminium silicate, also containing fluorine, and is of a rose or peach-blossom color. It finds some use for ornamental purposes and is a source of lithium salts. *Zinnwaldite* is of a complex composition, containing iron in addition to the potassium, lithium, and aluminium silicates. In color it is of a pale violet or yellow to brown and dark gray. *Biotite* (q.v.), or magnesium iron mica, is a magnesium, potassium, and iron silicate. It is usually dark-colored, as green, brown, or black. *Phlogopite* is also a magnesium mica, generally nearly free from iron, and usually containing some fluorine. It is usually dark in color, being yellowish brown to brownish red. *Lepidomelane* is an iron mica generally black in color. The micas occur in crystalline rocks, muscovite being a normal constituent of granite, gneiss, and similar rocks. The deposits from which sheet mica is obtained are found in a coarse granite called pegmatite. The preparation of mica for the market is comparatively simple. The blocks, after being hoisted from the mine, are freed from adhering rock and then split by means of wedges or heavy knives. After this the mica is cut up into sizes suitable for the market, usually in pound packages. The mica waste is utilized as described previously under *Muscovite*. Consult G. W. Colles, *Mica and the Mica Industry* (New York, 1906); H. S. de Schmid, *Mica, its Occurrence, Explora-*

tion, and Uses (2d ed., Ottawa, 1912); Hans Zeitler, *Mica, its History, Production, and Utilization* (London, 1913); also the volumes of the *Mineral Resources, United States Geological Survey* (Washington, annually).

MICA, Pearl. See Margarite.

MI'CAH (Heb. abbreviation of *mīkāyāh*, interpreted as, Who is like Yahwe?). One of the minor prophets, a contemporary of Isaiah. His book is sixth in the ordinary arrangement of the minor prophets, but third according to the Jewish canon, and this order is followed in the Greek version. All that we know of his life is that he was a native of Moresheth, a small town dependent upon Gath (Mic. i. 1; Jer. xxvi. 18), and that his activity falls in the reigns of Ahaz and Hezekiah, but hardly in the days of Jotham; roughly speaking, therefore, between 734 and 700 B.C. The Book of Micah, in its present form, may be divided into three sections, each beginning with "Hear ye." (1) Chaps. i and ii, addressed to all the people, describe the coming of Yahwe in judgment on the transgressions of Israel and Judah and the doom of Samaria; denounce luxury and covetousness as the sources of transgression and condemn the false prophets for leading the people astray; foretell the banishment of the people into captivity and promise their return under the guidance of Yahwe. (2) Chaps. iii–v, addressed to the heads and princes of the people, condemn their oppressive rapacity and declare that as they had been deaf to the cry of the poor in their wrongs, they, too, shall call on Yahwe, but will not be heard. The false prophets also who had deceived others shall themselves be made ashamed. This second threatening of judgment is followed by a second and fuller promise of a better time. (3) In chaps. vi and vii Yahwe, calling on the people to hear and on the mountains to be witnesses of the controversy, appeals to all His past government over Israel as approving His righteousness. The people, answering, complain that the burden of the sacrifices required is too great to be borne, and Yahwe, in reply, says that He asks of them only to do justly, love mercy, and walk humbly with God. That they had failed to comply with these demands is shown by the treasures of wickedness found in their houses, by the scant measures used, the false balances, the deceitful weights. For these crimes punishments will be inflicted; the wheat, the oil, and wine shall be cut off. The prophet mourns the justice of the sentence and acknowledges the guilt of all classes of the people. Yet he waits for the salvation of Yahwe, triumphing in His pardoning mercy, which will certainly be manifested, and in His faithfulness, which will perform all that He had solemnly sworn to Abraham in the days of old.

These three divisions, however, do not correspond either to the original order or character of the discourses embodied in the book. The first three chapters (with the exception of ii. 12–13) depict conditions prevalent prior to the destruction of Samaria and may be attributed to the prophet Micah, though with editorial additions and adjustment to the rest of the book. Chaps. iv and v, however, with their glimpse into future times, are regarded by many scholars as embodying the views and aspirations of the struggling postexilic religious community, weighted by the sense of guilt, regarding its own sufferings as a punishment for transgressions in the past, and looking forward to a redemption and restoration of national glory, which can only come from Yahwe Himself. There are reasons for supposing that chaps. i–v once formed the entire Book of Micah, the first three being by the prophet himself and forming the text, as it were, to the last two chapters, justifying the sufferings in postexilic days. By way of consolation the prophecy of the restoration of the Davidic dynasty was composed and added. In the same spirit, as a comment upon the real Micah, chaps. vi and vii are supposed to have been written, which again present the same two sides—Yahwe's justification in bringing such sufferings upon His people and the consolatory promises for the future. Chaps. iv–vii, according to this view, belong in the main to the latter part of the Persian period, with minor additions thought to have been made in still later times. The text of the Book of Micah, it should be added, is not well preserved, and this enhances the difficulties of a satisfactory interpretation.

Bibliography. C. P. Caspari, *Ueber Micha den Morasthiten und seine prophetische Schrift* (Christiania, 1851–52); T. Roorda, *Commentarius in Vaticinia Michæ* (Leyden, 1869); T. K. Cheyne, "The Book of Micah," in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1882); B. Ryssel, *Untersuchungen über die Textgestalt und die Echtheit des Buches Micha* (Leipzig, 1887); J. Taylor, *The Massoretic Text and the Ancient Versions of the Book of Micah* (London, 1891); H. J. Elhorst, *De profetie van Micha* (Arnhem, 1891); the commentaries on the minor prophets, especially those of Julius Wellhausen (3d ed., Berlin, 1898), W. Nowack (2d ed., Göttingen, 1903), Karl Marti (Tübingen, 1904), R. F. Horton (Oxford, 1906), Van Hoonacker (Louvain, 1908), and G. A. Smith (new ed., 2 vols., New York, 1912); the Old Testament Introductions quoted under Exegesis.

MICARE DIGITIS. See La Morra.

MICA SCHIST. A metamorphic rock (q.v.) possessing a schistose or foliated structure and composed essentially of the minerals mica and quartz. The mica is generally the colorless variety known as muscovite (q.v.), though the dark variety, biotite, may be present also. When garnet or staurolite is present in addition to the quartz and mica, the rock is designated a garnetiferous or a staurolitic mica schist. Probably the greater number of mica schists have been formed by the metamorphism of sedimentary rocks through the agency of orographic (mountain-building) forces. Other mica schists, and especially the variety known as sericite schists, have been developed from acid igneous rocks (q.v.) by the action of the same forces. Of many mica schists, and especially those of Pre-Cambrian age, it has been found impossible as yet to determine whether their origin is sedimentary or igneous. See Metamorphic Rocks.

MICAW'BER, Mr. Wilkins. In Dickens's *David Copperfield*, an improvident, unpractical, and visionary character, believed to be intended as a portrait of Dickens's father, and Mrs. Micawber is said to represent his mother.

MICEL'LAR THEORY (from Neo-Lat. *micella*, dim. of Lat. *mica*, crumb). A theory proposed by the botanist Nägeli in 1862 to account for the physical properties of organized bodies like starch grains, cell walls, etc. He assumed that the molecules of the chemist are united into larger unions, constituting molecules of a higher order, which he called micellæ. These

hypothetical micellæ are extremely minute, never being visible even with the highest powers of the microscope. He further claims that the growth in thickness of a cell wall is due to the intercalation (intussusception) of new micellæ of cellulose between the micellæ which have become widely separated from each other by the stretching of the wall. Strasburger, the most important opponent of the micellar theory, holds that the growth in thickness of a cell wall is due to the deposition of material upon its inner surface. The micellar theory is still current, but is not so strongly supported as formerly.

MICHABO, mē-chā'bō. See MANABOZHO.

MICHAEL, mī'kā-ĕl *or* mī'kĕl (Heb., Who is like God?). One of the archangels. In Dan. x. 13 he is called "one of the chief princes"; in x. 21, "Michael your prince"; and in xii. 1, "the great prince which standeth for the children of thy people." It is thought by some scholars that Michael is also meant by "the one like unto a son of man" in Dan. vii. 13. In Ethiopic Enoch ix, 1, Michael appears as one of the four great angels, with Uriel, Raphael, and Gabriel; in xl, 9 and lxxi, 9, Phanuel takes the place of Uriel; while in xx, which gives the oldest list of the seven archangels (Uriel, Raphael, Raguel, Michael, Saraqael, Gabriel, and Remiel), he occupies fourth place. In Jude 9 Michael is represented as fighting with the devil for the body of Moses; this account was taken from the Apocalypse of Moses, though it is not extant in the part of the Latin version of this work that has been preserved. In Rev. xii. 7–9 he fights against the dragon. His special function, as described in Enoch, is to act as scribe in entering in the heavenly books the deeds of the angelic patrons of nations, while in the *Ascension of Isaiah* he records the deeds of all men in the heavenly books. According to the Talmudic account, Michael is the prince, the chief of the angels, the high priest who in the fourth heaven offers the souls of the departed as a sacrifice. He is looked upon as the medium through whom the Law was given to Moses on Mount Sinai. In the Western Christian church, September 29 (Michaelmas) has been set aside as his day; the Greek church keeps November 9. Zimmern has shown that some of the conceptions connected with Michael represent attributes of Babylonian gods, like Marduk and Nebo, transformed to angels.

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MICHAEL, mī'kĕl *or* mī'kā-ĕl. The name of nine emperors of Constantinople.—MICHAEL I (died 845) succeeded to the throne on the death of Stauracius, in 811, conducted a war against the Bulgarians, but was a feeble monarch, who abdicated without fighting against Leo the Armenian, a general in his service, in 813 and, retiring to a monastery, passed the remainder of his life in devotional exercises.—MICHAEL II (died 829), surnamed the Stammerer, was born in upper Phrygia, of an obscure family, but was ennobled by Leo the Armenian, who, however, afterward condemned him to death on a charge of conspiring against him. His life was saved by the assassination of Leo, and Michael was crowned Emperor in 820. He was cruel and arbitrary. His reign was threatened by a revolt on the part of his general Euphemius, who proclaimed himself Emperor. The rebellious general was slain near Syracuse in Sicily. During Michael's reign the Saracens wrested Crete and Sicily from the Empire.—MICHAEL III (c.838–867), surnamed the Drunkard, was grandson of Michael II and succeeded his father, Theophilus, in 842, his mother, Theodora, being Regent until 856. In his reign the Varangians appear as foes to the Empire, and the foundation for the separation of the Eastern and Western churches was laid by a quarrel between the Patriarch, Photius, and the Pope, Nicholas I. Michael was assassinated by Basil the Macedonian in 867.—MICHAEL IV (died 1041), surnamed the Paphlagonian, from the place of his birth, was raised to the throne by the Empress Zoë, who on account of her infatuation for him is suspected of having murdered her husband. He was successful in war against the Bulgarians in 1040, but died in 1041.—MICHAEL V succeeded the last named, who was his uncle. Having exiled the Empress Zoë, he was overthrown by the people in 1042 and, after having his eyes put out, was sent to a monastery.—MICHAEL VI succeeded the Empress Theodora in 1056, but retained the throne only a year, when he was compelled to resign in favor of Isaac Comnenus. He retired to a monastery. He was surnamed Stratioticus, and with him the Macedonian dynasty became extinct, his successor being of the family of the Comneni.—MICHAEL VII DUCAS, or PARAPINACES (starver), was a son of Constantine X, and after the regency of his mother Eudoxia he ascended the throne in 1071. Having given too much power to unworthy favorites, he was forced by an insurrection to abjure the throne in 1078 and retire to a monastery.—MICHAEL VIII PALÆOLOGUS (1234–82) was the first of his family to ascend the Byzantine throne. He was proclaimed joint Emperor of Nicæa with John Lascaris about 1259, and soon after became sole ruler. In 1261 Constantinople, which had been held by the Latins since 1204, was captured, and Michael caused his young colleague to be blinded and dethroned. In order to retain possession of the capital he made some pretense at an attempt to bring about a union of the Western and Eastern churches, which, however, proved to be of short duration. —MICHAEL IX, son of Andronicus II, was associated with his father, but died before him in 1320. See BYZANTINE EMPIRE. Consult: Edward Gibbon, *Decline and Fall of the Roman Empire*, edited by J. B. Bury, vols. v, vi (London, 1898), for all the above; for Michael I, II, III, J. B. Bury, *History of the Eastern Roman Empire* (ib., 1912); for Michael VIII, Edwin Pears, *Destruction of the Greek Empire* (ib., 1903), and Alice Gardner, *Lascarids of Nicæa* (ib., 1912).

MICHAEL, ARTHUR (1853–). An American chemist, born in Buffalo, N. Y. He studied at Berlin and Heidelberg and at the Ecole de Médecine of Paris. In 1882–89 and from 1894 to 1907 he was professor of chemistry in Tufts College; in 1912 he became professor of organic chemistry at Harvard. His researches in organic chemistry include studies in a new process for the formation of aromatic sulphones, in forming aldol from ethyl aldehyde,

in the action of aldehydes and aromatic oxyacids on phenols, and in new reactions with sodium malonic ester. His writings include contributions to the *Proceedings* of the National Academy of Science, to the *American Chemical Journal*, and to the *Berichte der deutschen chemischen Gesellschaft*.

MICHAEL ANGELO. See MICHELANGELO.

MICHAEL AT'TALIA'TES. A Byzantine jurist of the eleventh century. By command of Michael Ducas, Emperor of the East, he published in 1073 a work entitled Πόνημα νομικὸν ἤτοι σύνοψις πραγματική, i.e., a compendium of law. He also wrote other works, including a history of the period from 1034 to 1079. A Latin rendering of the *Synopsis* by Leunclavius is to be found in his second volume of the compilation *Jus Græco-Romanum*. The *History* is published in the Bonn edition of the corpus of Byzantine writers. Consult Karl Krumbacher, *Geschichte der byzantinischen Litteratur* (2d ed., Munich, 1897).

MICHAELIS, mē'kä-ā'lĭs, ADOLF (1835–1910). A German archæologist. He was born at Kiel and studied at the university of his native town, in Berlin, and in Leipzig. After 1862 he was professor of classical philology and archæology at Greifswald, Tübingen, and Strassburg. In 1873 he edited *Bilderchroniken*, by O. Jahn, his uncle and teacher, a discussion of the Greek inscribed reliefs of mythological and historical scenes. In 1874 he became a member of the German Central Archæological Institute in Rome, the history of which he published in 1879, in *Geschichte des deutschen archäologischen Instituts zu Rom*. Besides his critical edition of Tacitus' *Dialogus de Oratoribus* (1868) and articles in the periodicals, he published many archæological treatises, such as *Der Parthenon* (1871); *Ancient Marbles in Great Britain* (Eng. trans. by Fennell, 1882); *Strassburger Antiken* (1901); *Die archäologischen Entdeckungen des neunzehnten Jahrhunderts* (1906; Eng. trans. by Bettina Kahnweiler, *A Century of Archæological Discoveries*, 1908). He also prepared editions of Springer's *Handbuch der Kunstgeschichte* (1898, 1901, 1904, 1907).

MICHAELIS, JOHANN DAVID (1717–91). A German biblical scholar. He was born on Feb. 27, 1717, at Halle, where his father, Christian Benedict Michaelis, was professor. After completing his studies at the university of his native town he traveled in England and Holland. In 1746 he became professor of philosophy at Göttingen and in 1750 professor of Oriental languages. From 1753 to 1770 he was one of the editors of the *Göttinger gelehrte Anzeigen*, and for some years he filled the office of librarian to the university. He died at Göttingen, Aug. 22, 1791. Michaelis may be regarded as among the earliest to use Oriental critical learning in the service of biblical interpretation. His chief works are his *Hebräische Grammatik* (1778); *Einleitung in die göttlichen Schriften des neuen Bundes* (4th ed., Göttingen, 1788; Eng. trans., *Introduction to the New Testament*, London, 1823); *Mosaisches Recht* (2d ed., 1776–80; Eng. trans., *Commentaries on the Laws of Moses*, 1810–14); *Moral* (1792–1823); *Orientalische und exegetische Bibliothek* (1786–93). Consult his *Lebensbeschreibung von ihm selbst abgefasst*, edited by Hassencamp (Rinteln, 1793); his letters (Leipzig, 1794–96); his *Life* by R. Smend (Göttingen, 1898); T. K. Cheyne, *Founders of Old Testament Criticism* (London, 1893).

MICHAËLIS, KAROLINE. See VASCONCELLOS, KAROLINE MICHAËLIS.

MICHAËLIS, mĭ-kä-ā'lĭs, SOPHUS (1865–). A Danish author, born at Odense. Educated at the University of Copenhagen, he traveled extensively abroad and wrote *Solblomster* (1893), a collection of poems, and the romance *Æbelö* (1895), which were successful. Later appeared *Sirener* (1898), a collection of poems; *Livets Fest* (1900); *Palmerne* (1904), impressions from Egypt; the novels *Dödedansen* (1900) and *Giovanna* (1901); the dramas *Revolutionsbryllup* (1906), *Lægen* (1906), *St. Helena* (1911), and *Den evige Sövn* (1912). His lyric verse, showing French influence, represents his best work. He wrote also a monograph on Jens Jerichau, the sculptor (1906), and edited *Kunst* (1900–06). His translations of Flaubert's *Salammbô*, *Aucassin et Nicollete*, and *Tentation de St. Antoine* were excellent.

KARIN MICHAËLIS STANGELAND (1872–), Michaëlis' first wife, separated from him and married an American. For purposes of authorship she wrote her name as above. She was born (Beck-Bröndum) at Randers. Her poems and novels include: *Höit Spil* (1898); *Fattige i Aanden* (1901); *Barnet* (1902); *Hellig Enfold* (1903); *Gyda* (1904); *Munken gaar i Enge* (1905); *Betty Rosa* (1908); *Tro som Guld* (1909); *Den farlige Alder* (1910); *Bogen om Kjærighed* (1912); *Grev Sylvains Hævn* (1913); also *Danske Foregangsmænd i Amerika* (1911), with Joost Dahlerup.

MICHAELIUS, mē-kä'lē-ŭs, JONAS (1577–?). The first clergyman of the Dutch Reformed church in New Amsterdam. He was born in north Holland. In 1600 he entered the University of Leyden and after his graduation became a country pastor. In 1624 he was appointed to São Salvador in Brazil, the next year to a settlement in Guinea, and in 1628, after a short visit to Holland, he sailed for New Amsterdam. His ministrations there probably lasted until 1633, when he was succeeded by Everardus Bogardus (q.v.). A letter written by him in 1628 and now in the manuscript collection of the New York Public Library gives the only extant first-hand account of New Amsterdam as it then was. A translation of this letter appears in the *Collections* of the New York Historical Society for 1880.

MICHAELMAS, mĭk'el-mas (from *Michael* + *mass*). The old English name of the day set apart in commemoration of St. Michael and the other angels, September 29. The observance of this day is commonly traced to an apparition of the archangel which is supposed to have taken place on Monte Gargano in Apulia in 493, or more probably in 520; but it is likely, for various reasons, that the festival is even older. This particular apparition is commemorated in the Roman Catholic church on May 8; the feast day in September has a wider application, in the Eastern and Anglican churches as well, and is intended to recall the benefits received through the ministry of angels. In England it has been for centuries an important date as a quarter day and the beginning of legal and university terms. For the old beliefs and customs connected with the day, consult Robert Chambers, *The Book of Days* (new ed., 2 vols., London, 1906).

MICHAEL NIKOLAIEVITCH, mĭ'kĕl nē'kō-lā'yĕ-vĭch (1832–1909). Grand Duke of Rus-

sia, the fourth son of the Emperor Nicholas I. In the artillery branch of the army he was elevated to the rank of general. He was for some time Governor of the Caucasus and in 1877 commanded the army which invaded Turkish Armenia. In 1881 he was made President of the Privy Council of State and commander in chief of the cavalry.

MICHAEL OBRENOVITCH (ô-brĕn′ô-vĭch) **III** (1823–68). Prince of Servia, born at Kraguyevats, the younger son of Prince Milosh. After the death of his elder brother Milan in 1839 he was declared Prince of Servia by the Turkish government. He soon made himself very unpopular by favoring the Russian policy, and the discontent of the Servian people was increased by his policy of arbitrary and heavy taxation. A revolution broke out in 1842, and an act of the National Assembly expelled him and his family from the country. He fled to Semlin in Slavonia and lived in Vienna and Berlin, spending several years in traveling. In 1858 he returned to Servia, together with his father, whom he again succeeded in the government in 1860. He was a man of great ability and seemed honestly desirous to do his best for the country. He was successful in effecting cardinal changes in the military organization and freed the Servian fortresses from Turkish garrisons. On June 10, 1868, he was shot by a follower of Prince Alexander Karageorgevitch. He was succeeded by his cousin Michael Obrenovitch IV.

MICHAEL ROMANOV. Czar of Russia. See Romanov.

MICHALOWSKI BLASTING POWDER. See Explosives.

MICHAUD, mē-shô′, Joseph François (1767–1839). A French historian, born at Albens in Savoy. He studied in the ecclesiastical college of Bourg and in 1787 published a work, *Voyage au Mont Blanc,* followed by other essays. In 1791 he went to Paris, where he embraced the teachings of Voltaire and Rousseau. He was, however, a Royalist and advocated his views in the three Royalist papers, the *Gazette Universelle,* the *Postillon de la Guerre,* and the *Courrier Républicain.* In 1794 he founded the *Quotidienne* and after the fall of Robespierre he contributed articles so openly favoring the Restoration that on Oct. 27, 1795, he was condemned to death, and only escaped by having this sentence commuted to one of banishment. In 1799 he returned to Paris and with a younger brother undertook the publication of the *Biographie moderne, ou dictionnaire des hommes qui se sont fait un nom en Europe depuis 1789.* His work *Tableaux historiques des trois premières croisades* began to appear in 1811, though not completed until 1822. Michaud was made member of the French Academy in 1812; the previous year he had founded, with his brother, the *Biographie universelle.* He also collaborated with Ponjoulat in editing the *Collection de mémoires pour servir à l'histoire de France,* which began to appear in 1836. In the *Dernier règne de Buonaparte* (1815) Michaud made a valuable contribution to Napoleonic history. He died at Passy, Sept. 30, 1839. In 1792 Michaud wrote a work *L'Apothéose de Franklin,* of interest to Americans.

MICHAUT, mē-shô, Gustave (1870–). A French literary critic, born at Perrigny. He taught French literature in various institutions before becoming a lecturer at the University of Paris in 1904. In 1911 his lectures in the United States were well received. Several of his works were crowned by the Academy. Michaut became an authority on Pascal and Sainte-Beuve, his publications including: *Edition des pensées de Pascal* (1896); *De l'abrégé de la vie de Jésus* (1897); *Des Discours sur les passions de l'amour de Blaise Pascal* (1900); *Le génie latin* (1900); *Aucassin et Nicolette* (1901); *Les époques de la pensée de Pascal* (1902); *La comtesse de Bonneval* (1903); *Sainte-Beuve avant les lundis* (1903); *Etudes sur Sainte-Beuve* (1904); *Etude sur le livre d'amour de Sainte-Beuve* (1905); *La Bérénice de Racine* (1907); *Pages de critique et d'histoire littéraire* (1910); *Histoire de la comédie romaine* (1912); *La Fontaine* (1913).

MICHAUX, mē′shô′, André (1746–1802). A French botanist and traveler. He was born at Satory, near Versailles, and studied under the noted botanist Bernard de Jussieu. In 1779 he traveled in England, and the next year through Auvergne and the Pyrenees, and, on his return to Paris, introduced several new varieties of Spanish grain and other plants. In 1782 he was sent to Persia on a scientific mission. From 1785 on he traveled extensively in eastern North America on a similar mission at government expense, but the French Revolution compelled him to return for want of funds. He was shipwrecked on the voyage to France and lost nearly all his specimens. In 1800 he sailed for Madagascar, where he died two years later. His most important publications are *Histoire des chênes de l'Amérique septentrionale* (1801) and *Flora Boreali-Americana* (1803).

MICHAUX, François André (1770–1855). A French botanist, son of André Michaux. He accompanied his father to the United States, and his *Histoire des arbres forestiers de l'Amérique septentrionale* (3 vols., 1810–13) contains the result of his explorations and gives an account of the distribution and the scientific classification of the principal American timber trees north of Mexico and east of the Rocky Mountains. Under the title *The North American Sylva* it was translated by Hillhouse, with three supplementary volumes on the trees of the Rockies by T. Nuttall (1841–49).

MICHEL, mē′shĕl′, Claude, called Clodion (1738–1814). One of the most prominent French sculptors of the rococo period. He was born in Nancy and studied in Paris under his uncle, J. S. Adam, and under Pigalle. In 1759 he won the first prize for sculpture and in 1762 removed to Rome, where he remained nine years. Clodion was a typical representative of the graceful, coquettish, and often immoral art which was fashionable in France before the Revolution. He showed inexhaustible fantasy and skill in his small delicate figures, usually of terra cotta, and reliefs representing nymphs, fauns, cupids, and the like, by which he is chiefly known, but in the more serious works, such as the statue of Montesquieu, now in the Palais de l'Institut, Paris, and the "Vestal Crowned with Flowers," the noble lines and fine arrangement of drapery rank him among the best masters of the age. After the Revolution he attempted to adopt the new classical style, but without much success. His reliefs for the Arc du Carrousel and the Colonne de la Grande Armée date from this late period. He modeled also many charming decorations for private palaces, which have not survived. Most of his terra cotta and marble statuettes, vases, candelabra, etc., are pre-

served in private collections; there are several examples in the J. P. Morgan collection, on loan in the Metropolitan Museum, and this museum owns (Altman collection) two particularly fine specimens. The statue and relief of St. Cecilia in Rouen Cathedral also deserve mention. Clodion was elected an associate of the Academy, but never attained a full membership. Consult Thirion, *Les Adam et Clodion* (Paris, 1885).

MICH'EL, Dan (i.e., *Dominus* or Master Michael), of Northgate (fl. 1340). An English translator. Nothing is known concerning his personal history except that he was a brother in the cloister of St. Augustin of Canterbury. In 1340 he completed his translation of *La somme des vices et des vertus*, a moral treatise, founded on *Le miroir du monde* (c.1250), and written in 1279 by Frère Lorens, a Dominican monk, for the use of Philip II of France. The translation is entitled the *Ayenbite of Inwit* (the again biting of the inner wit) or the *Remorse of Conscience*. The work gives a detailed exposition of the Ten Commandments, the twelve articles of faith, the seven petitions of the Lord's Prayer, the seven gifts of the Holy Spirit, and the seven heads and ten horns of the beast in the Apocalypse. Interesting in itself, it is of great linguistic value, as it is written in the dialect of Kent. Consult the edition by Morris, Early English Text Society (London, 1866).

MICHEL, mē'shĕl', Francisque Xavier (1809–87). A French historian and antiquary. He was born in Lyons and educated there. He went to Paris and in 1833 he was sent by Guizot to England to examine documents pertaining to the ancient history of France. In 1837 he was in Scotland on the same mission. He edited many monuments of old French literature, among them the *Chanson de Roland* and the *Roman de la rose*. His historical works include *Histoire des races maudites de la France et de l'Espagne* (1847); *Les Ecossais en France et les Français en Ecosse* (1862); *Recherches sur le commerce pendant le moyen-âge* (1852–54); *Le pays basque* (1857).

MICHEL, François Emile (1828–1909). A French painter and writer on art, born in Metz. He was the pupil of Migette and Maréchal, the glass painter, and began to exhibit in 1853. His paintings include "Autumn Sowing" (1873) and "The Dunes near Haarlem" (1885), both in the Luxembourg. He contributed articles on art to the *Gazette des Beaux-Arts* and other periodicals and published *Les musées d'Allemagne* (1886); *Rembrandt* (1886; Eng. trans., 1903); *Jacob van Ruysdael et les paysagistes de l'école de Haarlem* (1890), and other biographies for the series, *Les artistes célèbres; Les Maîtres du paysage* (1906; Eng. trans., *Great Masters of Landscape Painting*, London, 1910); *Nouvelles études sur l'histoire de l'art* (1908); *La forêt de Fontainebleau* (1909). He was elected a member of the Institute in 1892.

MICHEL, Louise (1830–1905). An anarchist agitator, called the Red Virgin. She was the illegitimate daughter of the son of the master of the château of Vroncourt, in the Department of Marne, France; received a good education from her grandfather and went to Paris, where she taught school till the rising of the Communists in 1871. She joined them, fought among the insurgents, and was taken prisoner by the Versailles troops. Tried by court-martial, she was condemned to death, but her sentence was commuted to transportation to New Caledonia. Freed in 1880, she devoted herself to agitation among the poor in Paris, and was sentenced in 1883 to six years' imprisonment. She was released, however, in 1886 and went to London, whence she continued to carry on her propaganda. In 1895 she returned to Paris. She published two novels, two plays, and her *Mémoires* (1886). Consult E. Girault, *La bonne Louise* (Paris, 1906).

MICHELANGELO, mē'kĕl-ăn'jâ-lō (Michelagniolo Buonarroti) (Michael Angelo) (1475–1564). A Florentine sculptor, painter, architect, and poet, the most prominent artist of the High Renaissance and the most influential figure in modern art. He was born at Caprese, March 6, 1475, the son of Lodovico Buonarroti. His family, the Buonarroti-Simoni, held small landed possessions and had long been honorably identified with public office in Florence. At the time of Michelangelo's birth his father was podestà (governor) of Chiusi and Caprese, Tuscan mountain towns tributary to Florence. The infant was christened Michelagniolo (Florentine for Michelangelo), and upon his father's return to Florence was put to nurse with the wife of a stonemason of Settignano, imbibing, as he himself said, the love of sculpture with his nurse's milk. Destined for a scholar, he was then placed in the school of Francesco d'Urbino at Florence. Instead of devoting himself to books he spent his time drawing, and with painters' apprentices. By one of these, Francesco Granacci, with whom he had formed a friendship, he was introduced to the studio of the brothers Ghirlandaio, and, after much opposition on the part of his family, he was, in 1488, apprenticed to these masters. He does not appear to have acquired much besides a conscientious execution and sound knowledge of the fresco technique. His drawings while there excited admiration and surprise, as did also his first painting, a transcript on panel of Martin Schongauer's print, the "Temptation of St. Anthony."

In company with Granacci Michelangelo left Ghirlandaio's studio in 1489, to study sculpture in the garden of the Medici at San Marco. With the design of reviving sculpture, which had fallen behind painting at Florence, Lorenzo de' Medici had established an academy there, at the head of which he placed Bertoldo, a pupil of Donatello. A marble masque of a faun (Uffizi), which Michelangelo skillfully changed in accordance with the advice of Lorenzo, so pleased the latter that he invited him to live in his house, and procured his father a place in the Florentine customs. In the society of such men as Poliziano the poet, Pico della Mirandola, Marsilio Ficino the Platonist, and Lorenzo himself, he became familiar with Italian literature and humanist culture. He was also influenced by the great political and religious movements of the day. To the spell of Savonarola's eloquence may be attributed, at least in part, his intense love for Florentine liberty and his deep religious feeling. His artistic training was an admirable combination of Florentine realistic and classic influences. Through Bertoldo he became grounded in the works of Donatello; he studied the antique in the Medici collection and sketched Masaccio's frescoes in the Brancacci Chapel. He was also, perhaps at this early period, and certainly later in his career, influenced by the painting of Luca Signorelli, who alone among the early painters

used the human nude to express emotion. Of the two surviving works of his student days—both bas-reliefs now in the Casa Buonarroti, Florence—the seated "Madonna with the Infant Jesus" is in the manner of Donatello. The other, the so-called "Battle of the Centaurs," is in the over-rich style of late Roman reliefs, which were doubtless his models; but it shows the great, though still incipient, dramatic talent which marked his later works.

On the death of Lorenzo in 1492 Michelangelo returned to his father's house. Besides carving a statue of a Hercules, now lost, he devoted much time to the study of anatomy. In 1494 he returned to the palace of the Medici, where Lorenzo's impetuous son Piero now presided, but, frightened at a vision foretelling their destruction, in October of the same year he fled to Bologna and thence to Venice. At Bologna he found employment for almost a year upon the shrine of San Domenico. He completed a statue of San Petronio by Nicola da Bari, and carved a kneeling angel of rare beauty, bearing a candelabrum, which, as Grimm has shown, was long confounded with another by Nicola in the same church. At Bologna he saw on the façade of San Petronio the reliefs of Jacopo della Quercia (q.v.), a Sienese sculptor of great power and originality and related to himself in spirit. The influence of this master, strengthened during a later visit to Bologna, is seen as late as Michelangelo's frescoes of the Sistine Chapel. Returning to Florence, in 1495 he carved for Lorenzo de' Medici, of a younger branch of the family, a statue of the youthful St. John, which is usually identified with an original in the Berlin Museum, though Wölfflin thinks the latter a work by Girolamo da Santa Croce (d.1537). The sale of his next work, a "Cupid," of which the original is lost, caused his first journey to Rome, and during his stay there, which lasted till the spring of 1501, he executed a number of important works. For Jacopo Galli he carved the "Bacchus" in the Museo Nazionale, Florence, a statue realistic to the verge of ugliness, and lacking entirely the element of divinity. To the same period is usually assigned the well-known statue in South Kensington Museum, which may be the "Cupid" that Condivi says Michelangelo executed for Jacopo Galli, although Springer has shown that this statue is more probably an "Apollo." The subject represented is a beautiful youth kneeling in the act of discharging his bow. But the chief work of this early Roman period, which raised him to the rank of the greatest sculptor of the day, was the "Pietà" in St. Peter's Church (1498–99), the first group, in the highest sense of the word, in modern sculpture. Seated at the foot of the Cross, the Virgin is represented with the dead Christ in her lap, gazing sadly at his wounded side and gently raising her hand. She is of youthful appearance, and of more heroic proportions than her son, whose dead body, the flesh of which is treated with marvelous delicacy, is reduced in size to preserve the harmony of the group.

After his return to Florence in 1501 Michelangelo, on June 5, signed a contract for 15 statues of saints for the Piccolomini Chapel in the cathedral of Siena. The inferior quality of these works as they now stand is such that it is impossible to attribute them to him. In August of the same year he received from the city of Florence a commission for a statue of David, 9 cubits in height, to be carved from a single block of marble. The statue was of national importance, intended to mark the deliverance of the city from the Medici and Cesare Borgia. On June 8, 1504, it was erected to the right of the entrance to the Palæzzo Vecchio, where it remained as a sort of palladium until, in 1873, it was removed to the Academy of Fine Arts for protection against the weather. The figure is frankly naturalistic, head and hands being unduly large, as in the case of the undeveloped youthful frame. The expression denotes expectation and confidence of victory; the action represented is at the moment at which the youth is about to unloose the string.

The "David" is the last work of Michelangelo's early or realistic period. A number of other works of the years 1501–04 cannot be exactly dated. While engaged on the "David" he completed, at the request of the signory, another statue of the same subject in bronze, which was sent as a present to a high official of the French court. Resembling the "Pietà," though probably somewhat earlier, is the life-size "Madonna of Bruges," purchased by the Mouscron family and still in their chapel in the cathedral of Bruges. He also carved two circular bas-reliefs of the Madonna, one in the Museo Nazionale, Florence, another in the Royal Academy, London. While executing the "David" he was also engaged in painting a "Madonna" for Angelo Doni (Uffizi). Though deficient in color this picture is wonderful in drawing and in the sturdy realism of the figures and is original in conception. Somewhat earlier than this is the unfinished Madonna in the National Gallery, London.

Michelangelo's second manner is characterized by an increasing departure from the realism of his early days and a reliance upon an unbridled imagination. His first work in which this new style prevails was his cartoon for the fresco of one of the long walls of the hall of the Great Council in the Palazzo Vecchio, executed in rivalry with Leonardo da Vinci (q.v.), to whom the other wall had been assigned. Begun in August, 1504, the cartoon was not completed till 1506, the fresco never having been carried out. The subject was the so-called "Battle of Pisa," an incident from the war between Florence and Pisa, in 1364, when 400 Florentines were surprised by the enemy while bathing in the Arno at Anghiari. This was considered by contemporaries as his greatest painting, and practically revolutionized Florentine art. The cartoon was destroyed in 1516, and only survives in drawings at Holkham and Vienna (Albertina) and in the well-known line engraving of a single group by Marcantonio, entitled "Les Grimpeurs."

Its execution was interrupted early in 1505 by a summons to the artist from Rome by Pope Julius II, who of all Michelangelo's patrons best understood the man and his art. His first commission was for the Pope's sepulchral monument, to be placed under the cupola of the new church of St. Peter's, and to contain 40 colossal statues, besides bronze reliefs and other decorations. Michelangelo spent over eight months in Carrara procuring the marble for this, the darling scheme of his life. But when, after his return to Rome, the Pope, moved by the intrigues of Bramante, wished to defer the execution of the monument, and the artist was slightingly treated, he left Rome in a rage, sending the Pope word to seek him elsewhere. Notwithstanding the latter's efforts and the mediation of the Florentine govern-

ment a reconciliation was not effected till the end of 1506, at Bologna, which the Pope had just added to the papal domains. Until Feb. 21, 1508, the artist was occupied with the bronze statue of Julius II, three times life size, which was destroyed when the Bentivogli recovered the city three years later. Upon rejoining the Pope at Rome he was induced, much against his will, to undertake the decoration of the vault of the Sistine Chapel.

It was a task of colossal proportions (the ceiling alone measuring 132 feet by 44 feet) and he did it practically alone. In October, 1521, the scaffolding was removed. Immediately upon its completion it was hailed as the greatest piece of work ever done by painter's hand. Even Raphael's style was transformed after he had seen it. Michelangelo arranged the vast space as though it had been roofless, framing it with architecture in perspective delusion and filling the open spaces with paintings. Just above the windows are the figures of the ancestry of Christ in attitudes of eager waiting; above them, 12 gigantic figures of the prophets and sibyls; in the corners, four representations from the history of Israel; while in the centre of the vault the stories of the "Creation of the World," the "Fall of Man," and the "Deluge" are told in nine pictures. The spaces of the architecture are filled with figures of male nudes, generally termed "slaves" (schiavi), in various attitudes. Among the central pictures the "Creation of Adam" is preëminent. Adam is depicted just on the point of rising, just as God's touch sends the first thrill of life through his veins. His body is the perfection of anatomical form and action, and the representation of the Almighty as the incarnation of omnipotence and mild compassion has never been equaled. The Delphic sibyl is young and beautiful, with an upturned look of rapture, the Cumæan is old and withered, the wisdom of the ages in her countenance. Of the prophets, Jeremiah is the image of deep thought and Zechariah a type of mental absorption; Jonah, typical of the resurrection, is a nude figure of remarkable foreshortening. In a clever and convincing critique Professor Wölfflin has established the chronological order in which the various subjects were painted. Among surviving figures intended for the tomb as originally planned are the two incomparable "Slaves" in the Louvre. One struggles with mighty effort to free himself from the bonds which hold him, the other sinks exhausted from the struggle. Both are an epitome of power and pathos. Belonging also to the original design are four rough-hewn figures now in the Florentine Academy.

On the death of Julius II in 1514 Michelangelo resumed work on his mausoleum, in accordance with a second plan on a slightly reduced scale, a pen-and-ink drawing of which is in the Uffizi. He was thus occupied till 1516; during this time he executed, at least in part, the most important of the statues intended for it. Foremost of these is the "Moses"—certainly the greatest colossal statue in modern art. Moses is portrayed at the moment when, enraged at the idolatry of the Israelites, he starts, with threatening brow, to quell and crush them. The technical execution is perfect, even to such details as the mighty beard, which his hand grasps convulsively, the muscular forearm, and the wonderful fold of drapery upon his knee. The two "Captive Youths" in the Louvre, also termed "Prisoners" and "Slaves," are ideal representations of the arts, dying and captive because of the death of their great patron.

In December, 1516, Michelangelo was compelled by the wishes of Pope Leo X, a Medici, to remove to Florence and busy himself with a façade for San Lorenzo, the family church of the Medici. He wasted three years of his life in the quarries of Carrara and Pietra Santa procuring the marble for this colossal design, when in 1520 the Pope gave up the plan. Then Cardinal Giulio de' Medici commanded his services for the Medicean Chapel in the same church, upon which work was begun in 1521. During this period he found time for the "Christ Risen," now in the church of the Minerva, Rome, upon which the finishing touches were put by the sculptor Frizzi—a figure which may justly be termed mannered, since it is rather an athlete than a Christ. Upon Cardinal Medici's elevation to the papacy as Clement VII, in 1523, the artist's entire time was taken up by the designs and statues for the Medicean Chapel and plans for the Laurentian Library. This work, however, was interrupted by the last great struggle of Florence for liberty.

Upon the sack of Rome by the army of Charles V, in 1527, the citizens arose and drove the Medici from Florence. Though he had never taken active part in public life Michelangelo was an ardent patriot, willing to serve his country. On Jan. 25, 1529, he was chosen one of the nine citizens in charge of the defense of the city, and on April 9 he became governor of the fortifications. His work took him to Pisa and Livorno, and he visited the Duke of Ferrara, the greatest Italian authority on fortifications. But convinced that Malatesta Baglioni, the general of the mercenaries, meant to betray Florence—as was actually the case—in September, 1529, he fled to Venice. He was received with great honor by the Doge and the nobility, but, declining their hospitality and the invitation of the King of France to enter his service, he returned to Florence and resumed his duties on the fortifications. After the capitulation of the city, Aug. 12, 1530, he remained for a time in hiding, but, on the Pope's invitation and pardon, resumed work on the statues for the Medicean Chapel. He had also received a commission from the city for a colossal "Hercules and Cacus," to stand opposite the "David," in commemoration of the expulsion of the Medici, but he only made the wax model now in South Kensington Museum. A copy of Michelangelo's "Leda and the Swan," a tempera painting executed some time later for the Duke of Ferrara, is at Dresden.

The chapel of the Medici—the new sacristy of San Lorenzo—is the most important work of its kind in modern art. In sculpture it marks the culmination of Michelangelo's style. The architectural problem was not constructive but decorative; and, conceived as a framing for the sculptures, the architecture is above criticism. The sculptures were only in part executed. On the entrance wall is an incomplete statue of the Madonna (1522) by Michelangelo, flanked by the patron saints of the Medici, Cosmas by Montorsoli, and Damian by Montelupo. Far more important are the tombs of the two Medicean dukes, on opposite sides of the chapel. The dukes are represented over life size, seated above their sarcophagi, and are rather allegorical than portrait statues—the representatives of contemplative and active life. Lorenzo's head rests

MICHELANGELO

"CREATION OF ADAM," FROM THE FRESCO IN THE SISTINE CHAPEL OF THE VATICAN

heavily on his wrist, and the beaver of his helmet is drawn over his eyes, which gaze on vacancy. Giuliano is represented as the victorious general looking down upon the battle field. Nothing could exceed the technical perfection of his Roman cuirass and of his hands resting upon the general's staff. At Lorenzo's feet, reclining upon the sarcophagus, are "Dawn" and "Twilight"; at Giuliano's, "Day" and "Night." "Dawn" is the most finished and beautiful of the statues; she starts as if from a dream, her face full of despondency. In "Night," a sleeping woman of magnificent physique, the sculptor has solved the difficult problem of a reclining figure in profile. "Twilight" and "Day" are male figures of Herculean proportions, the heads of which are unfinished. "Day," the grander of the two, is represented as gazing over his shoulder, showing treatment of the muscles of the back in this difficult position. In reality these allegories, intended for quite another purpose, were used by the artist to express his sorrow for the loss of Florentine liberty.

Though chiefly engaged upon the Medicean statues Michelangelo had also worked at Rome upon the tomb of Julius II. Luckily he was there when Clement VII died in 1534. As Duke Alessandro of Florence was bitterly hostile to him he remained at Rome, residing there until his death. At last he hoped to complete the mausoleum, which had been the darling scheme, as well as the bane, of his life. By threats and lawsuits the heirs of Julius II had embittered his existence during the reigns of Leo and Clement, but the popes used their power in his behalf, forcing the heirs to repeated changes of contract, each of which reduced the scale of the monument. Paul III was as unwilling as his predecessors to forego the glory of being served by Michelangelo. He annulled the contract with the Duke of Urbino, Julius's heir, compelling the latter to make a new one in 1542, according to which the tomb was finally erected before 1550. As it now stands in the church of San Pietro in Vincoli, the monument is but a shadow of the artist's great design. The statues adorning the lower part are by Michelangelo himself—the colossal "Moses" and on either side "Active Life" ("Leah") and "Contemplative Life" ("Rachel"). In their present position, which was not the one originally intended, the two female statues are dwarfed by the architectural surroundings. The statues of the upper story were imperfectly executed, after Michelangelo's designs, by Montorsoli, the best of them being a Madonna, begun by the designer himself. Four rough-hewn figures are now in the Academy, Florence.

Having thus freed the sculptor from all cares regarding the monument, Paul III required his services for the completing of the decoration of the Sistine Chapel. The entire altar wall (18 meters by 16) was to be covered by a painting of the "Last Judgment," the cartoon for which had been executed under Clement VII, but which was not carried out until 1534–41. It is the largest fresco in the world, containing above a hundred figures over life size. The centre of the composition is Christ, a beardless figure of Herculean proportion, in the act of condemnation, and the Virgin sits shrinking beside him. From all sides the terrified masses stream to the judgment seat. Below the graves are opening and the dead become flesh. The colors have suffered much from dust and candle smoke and the grand figures are much defaced. Their nudity having aroused adverse criticism, Paul IV employed Daniele da Volterra to clothe the most conspicuous examples—a task for which he received the name of "Il Braccetone" (the breeches maker). Michelangelo's last paintings (finished in 1550) were for the same patron—two large frescoes in the Pauline Chapel—the "Conversion of St. Paul" and the "Crucifixion of Peter," both of which were spoiled by restoration.

The last years of the artist's life were devoted chiefly to architecture. In 1546 he designed the beautiful cornice of the Farnese Palace and in 1547 he was appointed chief architect of St. Peter's. He accepted the post as a religious duty, refusing all pay, and until his death, through the reigns of five popes, he filled with credit this responsible position. Only the cupola of the present edifice, for which he left a model, was carried out, at least in part, according to his plans. Unfortunately he left no model for the whole church. We know, however, that he returned to Bramante's plan of a Greek cross, and that his design was much superior to the present building. (See SAINT PETER'S CHURCH.) His architectural works included plans for the Porta Pia and the transformation of the Baths of Diocletian into Santa Maria degli Angeli, which was unfortunately rebuilt during the eighteenth century, although his court of 100 columns survives. The general plan of the Capitoline Hill is due to him, the grand staircase and the Palace of the Senators being after his designs. He made a number of grand designs for the church of the Florentines at Rome and one for the well-known staircase of the Laurentian Library, Florence, which was carried out by Vasari. Finally, his plans were followed in the new fortifications of Rome.

The latter part of Michelangelo's life was dominated by deep religious feeling, which found expression in his drawings and poetry, besides the grand religious paintings and works of architecture upon which he was engaged. Of wonderful pathos and deep religious feeling is the unfinished sculptured group, the "Deposition from the Cross," which now stands behind the high altar in the cathedral of Florence. But the Florentine patriot was revealed in his bust of Brutus (Museo Nazionale), carved when Duke Alessandro was assassinated by Lorenzino in 1539. Though living almost like a hermit, Michelangelo received every honor that could come to an artist. Under successive popes he was chief architect, painter, and sculptor of the Vatican; he was made head of the new Academy of Florence. Popes, kings, and princes sought the honor of a work by his hand. He died Feb. 18, 1564. His body was conveyed secretly from Rome and buried at Santa Croce, the Pantheon of Florence. His house in Florence was left by the last surviving member of the family to the city, and is now used as a museum of his works, containing the family archives.

In appearance he was of medium height and broad-shouldered; he had a large head, with broad forehead and protruding temples, small eyes, and a nose disfigured by a fist blow of Torrigiano, a fellow pupil in the Medici Gardens. He was of a noble and generous character. If lovingly treated, any favors could be obtained from him; but if treated otherwise, not even the popes could influence him. Some of his most charming traits were his devotion to his family, his obedience and humility towards his father,

a selfish and whimsical man, and his kindness to his greedy brothers. He was kind and gentle to his dependents and fair in his judgment of other artists; but if he thought himself ridiculed his tongue could be sharp enough. The sad experiences of a highly sensitive nature tended to make him increasingly suspicious and irritable. Nevertheless, he remained charitable and generous, and he was scrupulously honest at a time when this was a virtue exceedingly rare.

No biography of Michelangelo could omit mention of the beautiful friendships which formed the chief joy of his declining years. Chief among these was his friendship for Vittoria Colonna, which began with his sixtieth year. The popular idea, which sees in this noble old lady the artist's Juliet, is quite erroneous, for their relation was based on a common love of literature and art and common religious views. In Cavalieri, a handsome and accomplished young Roman nobleman, as in other young friends, he saw an idealization of youthful beauty.

Michelangelo has been admirably characterized by Burkhardt as the "Man of Destiny" in the arts. Never in history were they so dominated by a single personality. For centuries the forms which he originated dominated architecture and sculpture, as the baroque style, and, to a large extent, painting as well. That which most impressed his followers and his contemporaries was the quality which the Italians call *terribilità*—his stormy energy of conception and intense dramatic, even violent, action. With him this was natural, the result of his own stormy emotions; with his imitators it was mannerism. His art is sublime rather than beautiful; its chief attribute is power. It does not condescend to win, but overwhelms by intellectual grandeur of conception and technical perfection of execution. It is absolutely original and unique. Evident in his earliest works, this quality predominates increasingly in his art, becoming arbitrary in later life. He is a destroyer of traditions, a creator of new types. Such an artist cannot be said to belong to any school; he stands apart in a class for himself.

He had, perhaps, as perfect a command of line as has ever been achieved. For his own works, as well as independent of them, he drew great numbers of designs, sometimes as many as a dozen heads to evolve an ideal type. Nearly all the chief galleries of Europe possess specimens of these drawings. In early life the pen was his favorite instrument; but later, when he relied more upon memory, he preferred chalk as a softer medium. To this last period belong the most celebrated examples, like the "Phaeton," "Tityus," and "Ganymede," drawn for Tommaso Cavalieri; the series of designs for Christ's "Crucifixion" and "Deposition," meditative and deeply religious in mood; and the "Archers" (Windsor collection), nude figures of wonderful beauty and movement.

His knowledge of anatomy is probably more nearly perfect than that of any artist since the Greeks. He acquired it in long years of diligent study, not only of the nude model and of classic sculpture, but through use of the dissecting knife in a laboratory furnished by his enlightened friend, the prior of Santo Spirito in Florence. He preferred to represent the human body as highly developed, and he inclined to the male type. His women, likewise of fully developed charm, are mostly types of middle life, although he created a few youthful examples of rare beauty, like the Delphic sibyl and the Madonna of Bruges. Like the Greeks, he used the human figure as expressive of emotion, only that with him the emotion is particular instead of general. Unlike other Italians he generalizes the faces, refusing all portraiture.

Michelangelo was essentially a sculptor, and only painted under protest. As his sonnet so beautifully states, he saw in every block of marble an imprisoned idea awaiting the sculptor's art to be freed. He probably made previous sketches, and in his early period used the human model, but his usual method was to use only a small wax model. Unlike present-day sculptors, he did all the work, even the rough-hewing, himself. He finished the bodies first, reserving the heads for the last. In his paintings the essentially pictorial qualities of perspective, atmosphere, and light are absent; nor was he a colorist in the Venetian sense. His color scheme was broadly massive and subdued, being subordinated to the human figures in his pictures. His paintings are decorative in the highest sense, and in his artistic development they are of especial importance, because he found a more facile medium in painting than in sculpture for the expression of his titanic thoughts. His architecture was decorative rather than constructive. He regarded only the general effect, which he obtained by heavy masses of light and shade, requiring of detail only a sharp and effective formation. In the cupola of St. Peter's, however, he created a complete constructive masterpiece, as perfect as any of the early Renaissance.

Michelangelo's poetry was valued as highly by his contemporaries as were his other artistic activities. They admired especially its deep philosophic thought, in which respect he indeed stands above the other poets of his day. Indeed, the value of his poetry is rather psychological than literary; it is often obscure and labored in expression. But when his nature was stirred by powerful emotions it found expression in some of the most beautiful sonnets and madrigals in the Italian or any other language. Some of the very finest are dedicated to Vittoria Colonna and Tommaso Cavalieri; these are mostly love poems. Others, like madrigals on the loss of Florentine liberty, are patriotic in character, and many are deeply religious, expressing the dignified attitude of a great soul, calmly awaiting the end.

Bibliography. The most important sources for the life of Michelangelo are the documents preserved in the Casa Buonarroti, Florence, consisting mainly of letters to and from the artist, his poems, memoranda, contracts, and like material, and a large collection of his letters purchased by the British Museum in 1859 from one of the Buonarroti family. The latter were first made known to the public by Hermann Grimm in his *Leben Michelangelos;* a selection of the former was indifferently edited by Milanesi, *Le lettere di Michelangelo* (Florence, 1875), and by Sebastiano del Piombo, *Les correspondants de Michel Ange* (vol. i, "Sebastiano del Piombo," Paris, 1890). By far the best edition of the letters, comprising all of historical importance, many for the first time published, is that of Carl Frey (Berlin, 1899). A brief selection of these letters, affording a picture of the artist's life, will be found in Carden's *Michelan-*

MICHELANGELO

"MOSES," FROM THE STATUE IN THE CHURCH OF SAN PIETRO IN VINCOLI, ROME

gelo (Boston, 1915). Of high importance also are the contemporary biographies of Michelangelo. The earliest of these appeared in the first edition of Vasari's *Lives* (Florence, 1550). The inaccuracies of this account impelled Ascanio Condivi, then an inmate of Michelangelo's household, to write his brief biography (Rome, 1553; later ed., Pisa, 1823; Eng. trans. in Charles Holroyd, *Michael Angelo Buonarroti* (New York, 1904). Based on the recollection of the great artist himself, this is the most important and reliable source, after his correspondence. It was pirated without acknowledgment by Vasari in his second edition of the *Lives* (1568; ed. by Milanesi, Florence, 1878), who supplied valuable additional information on Michelangelo's later years. Both of these biographies, together with other contemporary biographical materials, are best edited by Frey, *Sammlung ausgewählter Biographien Vasaris* (Berlin, 1887).

To no artist of any epoch have so many works been devoted as to Michelangelo. Among the more important modern biographies are those of Duppa and Quatremère de Quincy, *Lives and Works of Michael Angelo and Raphael* (London, 1856); J. S. Harford (London, 1857); H. F. Grimm, *Leben Michaelangelos* (Hanover, 1860; 10th ed., Berlin, 1901; Eng. trans. by F. E. Bunnett, new ed., 2 vols., Boston, 1896); also Charles Clement (Paris, 1860; trans. in "Great Artist Series"); Aurelio Gotti (Florence, 1875); C. C. Black (London, 1875); C. H. Wilson (London, 1876); Perkins (Boston, 1878); A. H. Springer (Leipzig, 1892); Scheffler (Altenburg, 1892); J. A. Symonds (London, 1892; 3d ed., 2 vols., ib., 1899); Knackfuss (Bielefeld, 1895); Karl Justi (Leipzig, 1900), an able and scholarly work, to which his *Michelangelo, kritische Untersuchungen* (2 vols., ib., 1908) forms a valuable appendix; Ricci (Florence, 1901); R. S. Gower (London, 1903); Charles Holroyd (ib., 1903); Fritz Knapp, in the "Meisterwerke der Kunst Series" (Stuttgart, 1906); Hans Mackowsky (Berlin, 1908); Romain Rolland (Eng. trans., London, 1912), a romantic effusion; A. Gottschewski (Stuttgart, 1913). The first critical work was that of Grimm, in which the artist is sympathetically treated and with high literary skill. Although as much space is devoted to his time and environment as to the artist himself, it remains an admirable work for the general reader. Of value for the artist's youthful period is H. Wölfflin, *Die Jugendwerke Michelangelos* (Berlin, 1887). W. R. Valentiner, *The Late Years of Michelangelo* (New York, 1914), is a good, though brief, critical appreciation. A. H. Springer, *Raffael und Michelangelo* (Leipzig, 1892), is a work of sound learning and criticism; also "Youth of Michael Angelo," from Vasari's *Lives*, in *Old South Leaflets*, *Annual Series*, vol. ix, no. 7 (Boston, 1891); *Masters in Art*, vol. ii (ib., 1901), containing an exhaustive bibliography; John La Farge, *Great Masters* (New York, 1903); G. B. Rose, *Renaissance Masters* (3d ed., ib., 1908); J. A. Gobineau, *Renaissance* (ib., 1913); F. P. Stearns, *Midsummer of Italian Art* (Boston, 1914). The most complete English life, of high literary and historical value, is that of J. A. Symonds. Henry Thode, *Michelangelo und das Ende der Renaissance* (3 vols., Berlin, 1902–12), gives an exhaustive treatment from the psychological standpoint. The latest extensive biography, Karl Frey, *Michelagniolo Buonarroti* (Berlin, 1907 et seq.), is a monument of scholarship and painstaking research, from the historical rather than the art critical point of view. Michelangelo's drawings have been ably treated in Bernhard Berenson, *The Drawings of the Florentine Painters*, vol. ii (New York, 1903), and published in facsimile with comments by Frey (800 plates, Berlin, 1907 et seq.).

Michelangelo's poems suffered much by being known through the garbled and mutilated edition of his grandson, Michelangelo the younger. A more complete edition was that of Guasti (Florence, 1863); but the best is by Frey (Berlin, 1897). The best English translation is by J. A. Symonds (3d ed., New York, 1912). Consult also: Wilhelm Lang, *Michelangelo als Dichter* (Stuttgart, 1861); Gabriel Thomas, *Michel Ange, poète* (Paris, 1892); and the admirable essay of Walter Pater, in his *The Renaissance: Studies in Art and Poetry* (New York, 1912).

MICHELET, mē'shlā', Jules (1798–1874). The greatest French historian of the Romantic school, born in Paris, Aug. 21, 1798, the son of a printer. He studied literature under Villemain (q.v.) and at 23 became professor of history in the Collège Rollin. He delivered lectures at the ancient Collège Sainte-Barbe and the Ecole Normale and, after the Liberal triumph in 1830, received an appointment at the Record Office, was made assistant of Guizot at the Sorbonne, and tutor of the Princess Clémentine. In 1838 he was made Academician and professor in the Collège de France, where he presently became involved in a bitter controversy with the Jesuits, the popular echoes of which may be felt in Sue's (q.v.) famous novel *Le juif errant*. In 1851 he refused the oath of allegiance to Napoleon, lost his offices, and lived mainly in Brittany and on the Riviera, giving himself wholly to literature, chiefly poetically romantic impressions of nature: *L'Oiseau* (1856); *L'Insecte* (1857); *La mer* (1861); *La montagne* (1868); of society, *L'Amour* (1858); *La femme* (1860); *La sorcière* (1862); *La bible de l'humanité* (1864); *Nos fils* (1869). From this imaginative and sociologic work he returned in his last years to history, adding 3 volumes (1872–75) to the 18 (1833–67) of his *Histoire de France* and bringing the narrative to Waterloo. Besides this monumental work he had contributed to history a *Précis d'histoire moderne* (1828); *Introduction à l'histoire universelle* (1831); *Origines du droit français* (1837); *Le procès des templiers* (1841–51); *Mémoires de Luther* (1845); and to religious and political controversy, *Les Jésuites* (in collaboration with Edgar Quinet, 1843); *Du prêtre et de la famille* (1845); *Du peuple* (1846). Characteristics of all Michelet's work are democratic enthusiasm, hatred of priests, sympathy for the oppressed, and a picturesque imagination that transformed vast learning into poetry and history into intuition. He is seldom an objective observer and rarely a dispassionate judge. Michelet's style, like his history, lacks continuity, it is striking rather than flowing, proceeds by leaps and bounds, appeals by rhythm as well as thought to emotion rather than reason. Michelet died at Hyères, Feb. 5, 1874. An edition of his *Works* in 40 volumes (1895 et seq.) is nearly completed. Besides the autobiographical *Ma jeunesse* (Paris, 1884) and *Mon journal* (ib., 1888), consult for his life: Jules Simon (Paris, 1886), F. Corréard (ib., 1886), J. Brunhes (ib.,

1898); Madame Quinet, *Cinquante ans d'amitié* (ib., 1900); Gabriel Monod, *Jules Michelet, études sur sa vie et ses œuvres, avec des fragments inédits* (ib., 1905); and for criticism: Taine, *Essais* (ib., 1855–56); Emile Faguet, *Politiques et moralistes du XIXe siècle* (ib., 1891); *Quarterly Review* (London, 1901).

MICHELET, mĭsh'lā', Karl Ludwig (1801–93). A German philosopher and follower of Hegel. He was born at Berlin and graduated at the University of Berlin. In 1829 he was appointed assistant professor of philosophy there. He published a large number of works on metaphysical subjects, including *Die Ethik des Aristoteles, etc.* (1827); *Das System der philosophischen Moral* (1828); *Geschichte der letzten Systeme der Philosophie in Deutschland von Kant bis Hegel* (1837–38); *Anthropologie und Psychologie* (1840); *Entwickelungsgeschichte der neuesten deutschen Philosophie* (1843); *Geschichte der Menschheit in ihrem Entwickelungsgang seit 1775* (1855–60); *Das System der Philosophie als exakter Wissenschaft* (1876–81); *Wahrheit aus meinem Leben* (1884), an autobiography; *Historisch-kritische Darstellung der dialektischen Methode Hegels* (1887), with S. H. Hering. From 1832 to 1842 he assisted in publishing the works of Hegel, whose best-known pupil he was, and from 1860 to 1873 he edited *Der Gedanke.*

MICHELET, mē'shĕ-lā', Simon Temstrup (1863–). A Norwegian theologian, born at Trondhjem. He was educated in Christiania, where he secured the Crown Prince's gold medal, and from 1888 at German universities. In 1894 he attained the doctorate in theology, and in 1896 he was appointed professor of Old Testament theology in the University of Christiania as Caspari's successor. His lecture at the Religious-Scientific Congress in Stockholm (1897) attracted much attention. In 1898 he studied in England and Scotland. He lectured extensively, and wrote many essays on the Old Testament, published in *Luthersk Kirketidende, For Kirke og Kultur,* and *Norsk theologisk Tidsskrift,* of which last he was coeditor after 1900. He wrote also *Det gamle Testamentes Syn paa Synden* (1899); *Gamle Helligdomme i nyt Lys* (1902); *Det gamle Testamentes Betydning for os.*

MICH'ELIN'IA. A fossil coral. See Favosites.

MICHELL, mĭch'el, John (1724–93). An English physicist and astronomer. He graduated at Queens' College, Cambridge, in 1748, became a fellow there the next year, and in 1762 was appointed professor of geology in the university. He invented the torsion balance, with the aid of which Cavendish later determined the mean density of the earth, and devised an "easy and expeditious method" of making magnets, described in a *Treatise of Artificial Magnets* (1750). He rendered important services to astronomy through numerous original contributions, including his *Enquiry into the Probable Parallax and Magnitude of the Fixed Stars from the Quantity of Light which they Afford us* (1767).

MICHELL, John Henry (?–). An Australian mathematician. He was a fellow of Trinity College, Cambridge, and later became assistant professor of mathematics at the University of Melbourne. In 1902 he was elected a fellow of the Royal Society. Michell became known for his researches in mathematical physics. His publications include: "Theory of Free Stream Lines," in the *Philosophical Transactions* (1890); "The Wave-Resistance of a Ship," in the *Philosophical Magazine* (1898); "The Stress in the Web of a Plate Girder," in the *Quarterly Journal of Mathematics* (1900); "The Direct Determination of Stress in an Elastic Solid," in the *Mathematical Society Proceedings;* and other papers in the same publications and in the *Messenger of Mathematics.*

MICHELOZZO, mē'kĕ-lōt'sō, Michelozzi (1396–1472). One of the foremost Florentine architects of the early Renaissance, also a sculptor and goldsmith. Michelozzo was born at Florence, the son of Bartolommeo, a Burgundian tailor, who was made a citizen of Florence in 1376. His name is a variation of Michele. He was brought up as a die cutter and goldsmith and assisted Ghiberti on the doors of the baptistery. At an early period he appears to have come under the influence of Brunelleschi, and in 1425 he entered into an association with Donatello (q.v.), which lasted until about 1435. There is little independent sculpture which can be definitely ascribed to Michelozzo, but he probably had a greater part in Donatello's and Luca della Robbia's work than has been credited to him. The bas-reliefs of the Aragazzi Monument in the cathedral of Montepulciano, the silver figure of John the Baptist in the Opera del Duomo, Florence, a terra-cotta statue of the Baptist in the court of the church of the Annunziata, Florence, and a bronze statue of the same in the Bargello, Florence, are the best known of his independent works. They are classic in motive, dignified, and well proportioned, but lacking in imagination and freedom and realism of treatment. His principal importance is in architecture, to which he devoted himself from about 1435, and in this art he ranks second only to Brunelleschi in the annals of the early Renaissance. His style is classic, with reminiscences of the Gothic, and is distinguished by great simplicity of decoration. As preferred artistic adviser and court architect to Cosimo de' Medici, he secured wide and important commissions. In 1446 he succeeded Brunelleschi as superintendent of the Florentine cathedral, but appears to have done very little on that building. In 1437 he built the chapel of the Medici in Santa Croce, Florence, and between 1437 and 1452 superintended the construction of the monastery of San Marco in Florence. The library and the two courts, where the Ionic order appears for the first time in the Renaissance, are especially interesting. From 1444 to 1455 he was chief architect of the monastery of the Annunziata in Florence, and in 1447 constructed the tabernacle of the Holy Cross in San Miniato, Florence. In 1457 he went to Milan to rebuild the fine palace presented by Francesco Sforza to Cosimo de' Medici, the so-called Medici Bank. Of his work in this city only the chapel of the Portinari, on the exterior of Sant' Eustorgio, survives.

His most famous work, however, is the Riccardi Palace in Florence, built for the Medici, and probably begun about 1440. The Riccardi Palace, which is perhaps the finest city house in existence, is really only a development of the typical Florentine palace of the Middle Ages under the refining influence of classical ideals. The last of Michelozzo's larger undertakings, his work upon the Palazzo Vecchio in Florence, was begun in 1454. His last recorded work is the Palazzo Rettorale at Ragusa in Dalmatia

(1464). Consult: Geymüller, *Jahrbuch der königlich preussischen Sammlungen*, vol. xv; Fabriczy, ib., vol. xxv (1904); Fritz Wolff, *Michelozzo di Bartolommeo* (Strassburg, 1900); Wilhelm Bode, *Florentiner Bildhauer* (Berlin, 1910).

MICHELS, mĭk′els, Robert (1876–). A German sociologist, born in Cologne and educated at the universities of Paris, Munich, Leipzig, and Halle. He lived in Italy for two years before becoming docent at the University of Brussels (1905), and in 1907 became a teacher (later professor) of economics at the University of Turin. He was appointed professor of economics and statistics at the University of Basel in 1913. His works, in Hungarian, German, Dutch, French, and Italian, are particularly important in so far as they deal with Italy. Among them the following may be mentioned: *Brautstandsmoral* (1903); *Ethik und Patriotismus* (1906); *Borghesia e proletariato nel movimento socialisto italiano* (1907; in German, 1906); *Storia del Marxismo in Italia* (1908); *Zur Soziologie des Parteiwesens* (1910; also in French and Italian); *Sexual Ethics* (1914; in German, 1911; in Italian, 1912; in French, 1913); *Saggi economici sulle classe popolari* (1914); *Probleme der Sozialphilosophie* (1914); and, in part, *Grundriss der Sozialökonomik* (1914).

MICHELSEN, mē′kĕl-sĕn, Peter Christian Hersleb Kjerschow (1857–). A Norwegian statesman, born at Bergen. He became prominent as a lawyer and shipowner, was elected to the Storthing in 1891, and from the radical Left passed over in 1903 to the coalition of conservatives and liberals which was in favor of an amicable settlement of the consular representation dispute with Sweden. In October he entered the Hagerup ministry, representative of that party, first as member of the State Council at Stockholm and later as Minister of Finance. Upon the resignation of Hagerup in March, 1905, Michelsen formed a new cabinet, and with the unanimous support of the Storthing entered on a course of rapid action which culminated in the dissolution of the union with Sweden. (For details, see Norway.) Michelsen was instrumental in the election of Prince Charles of Denmark (Haakon VII) as King, and by the new monarch was appointed first Premier of independent Norway in November, 1905, which position he held until his resignation in October, 1907.

MICHELSON, mī′kel-son, Albert Abraham (1851–). An American physicist, born in Strelno, Germany, and brought up in San Francisco. He graduated from Annapolis in 1873, and after several years' service in the navy went abroad and studied at Berlin, Heidelberg, and Paris (1880–82). On his return to America, Michelson was professor of physics at the Case School of Applied Science, Cleveland, Ohio (1883–89), then held a like chair in Clark University (1889–92), and in 1892 became head of the department of physics in the University of Chicago. His determinations of the velocity of light were marked by a high degree of accuracy. These experiments were begun in 1878, when Michelson was at the Naval Academy, and were concluded in 1882. His invention in 1887 of an interferential refractometer enabled him to determine linear distances in terms of the wave length of light, and he was invited by the International Bureau of Weights and Measures at Paris to ascertain the length of the standard meter in terms of the wave length of cadmium light. This investigation, carried on at the laboratories of the Bureau at Sèvres, was of great importance in that it enabled the International Prototype Meter to be reproduced at any time by reference to certain known quantities which are not only constant, but also are readily reproducible. In connection with Professor Morley, Michelson carried on a series of elaborate experiments designed to show the relative motion of matter and ether. He also devised the echelon spectroscope, by which he was able to secure greater dispersion than with a prism, and thus was able to study the Zeeman effect and other phenomena. His interferometer as applied to astronomy in connection with the telescope was found useful in resolving the light from the stars. A new and more efficient dividing engine for the construction of diffraction gratings for use in spectroscopy also represented a notable achievement by Professor Michelson. In 1897 he was a member, for the United States, of the International Committee of Weights and Measures and in 1902–03 a member of the Bureau International des Poids et Mesures. He was elected to the National Academy of Sciences and to numerous foreign societies, and became president of the American Physical Society (1901–02) and of the American Association for the Advancement of Science (1910). He received various prizes and medals, including a grand prize at the Paris Exposition of 1900, the Copley medal of the Royal Society of London in 1907, and also in 1907 the Nobel prize for physics. In addition to honorary degrees from many American universities he received an honorary D.Sc. from Cambridge in 1899 and a Ph.D. from Göttingen in 1911. He published *Light Waves and their Uses* (1903), a notable course of lectures delivered at Lowell Institute, Boston, in 1899.

MICHETTI, mē-kĕt′tē, Francesco Paolo (1851–). An Italian genre painter, born at Tocco da Casauria in the Abruzzi. He studied under Morelli (q.v.) at the Naples Academy and identified himself with the modern realistic school of Italian painters. His works are genre subjects of peasant life in southern Italy, painted with a rich, dazzling color, dramatic insight, and versatility of style, but at times they are erotic and morbid. His "Corpus Domini" (1877), "Palm Sunday" (1879), "The Shepherdess of the Abruzzi" (Modern Gallery, Rome), "Peasant Girl" (Pennsylvania Academy), and above all "The Vow" (1883, Modern Gallery, Rome) are good examples of this school of Italian art.

MICHIE, mĭk′ĭ, Peter Smith (1839–1901). An American military engineer and writer. He was born in Brechin, Scotland, came to the United States in 1843, and was brought up in Cincinnati. He graduated second in the class of 1863 at West Point and entered the Engineer Corps; served in the campaign of 1864 against Richmond; was chief engineer of the Army of the James (1865); and was at the head of all engineering operations of the left column at Hatcher's Run and in the pursuit of Lee's army. After the war, having attained brevet rank of brigadier in 1865, he was for a year engaged in the government survey of the theatre of the war; from 1867 to 1869 he taught various branches at West Point; was member of a coastal fortification commission which visited

Europe in 1870; and for the last 30 years of his life was professor of natural and experimental philosophy at West Point. He wrote: *Elements of Wave Motion Relating to Sound and Light* (1882; 2d ed., 1891); *Life and Letters of Emory Upton* (1885); *The Personnel of the Seacoast Defense* (1887); *Elements of Analytical Mechanics* (1887); *Hydromechanics* (1888); *Practical Astronomy* (1891; 2d ed., 1893), with F. S. Harlow; *General McClellan*, in the "Great Commanders Series" (New York, 1901).

MICHIELS, mē′shē′ĕl′, JOSEPH ALFRED XAVIER (1813–92). A French historian and writer on art and literature, born in Rome of Dutch-Burgundian parents. After studying law at Strassburg (1834) he made his home in Paris, where he devoted himself to the study of art and history. His writings, which display exact historical knowledge, critical ability, and careful research, include: *Etudes sur l'Allemagne* (1830; new ed., 1850); *Angleterre* (1844); *Histoire de la peinture flamande et hollandaise* (1845; new ed., enlarged, 1865–76) and its sequel, *L'Art flamand dans l'est et le midi de la France* (1877); *L'Architecture et la peinture en Europe depuis le Ve au XVIe siècle* (3d ed., 1873); *Rubens et l'école d'Anvers* (4th ed., 1877); *Histoire secrète du gouvernement autrichien* (4th ed., 1879); *Van Dyck et ses élèves* (1882).

MICHIGAN, mĭsh′ĭ-gan (Algonquin *michi*, great + *guma*, water), is one of the north-central States of the United States of America. Its area includes two large peninsulas, a northern and a southern peninsula, and several islands. Mackinac Island is one of the most historic areas in America. The international boundary line between the United States and the Dominion of Canada forms the eastern and most of the northern boundaries of the State. Ohio and Indiana lie to the south and Lake Michigan to the west of the southern peninsula. Wisconsin is south of the western part of the northern peninsula. The length and width of the northern peninsula are 318 miles and 164 miles respectively; of the southern peninsula, 277 miles and 195 miles respectively. The latitude extent is from 41° 44′ N. to 47° 30′ N. (Isle Royal is crossed midway by the forty-eighth parallel.) The longitude extent is from 82° 35′ W. to 90° 31′ W. Area, 57,980 square miles, including 500 square miles of inland waters, but not including the water surface of the Great Lakes within the State boundaries. Michigan ranks twenty-second in area among the States.

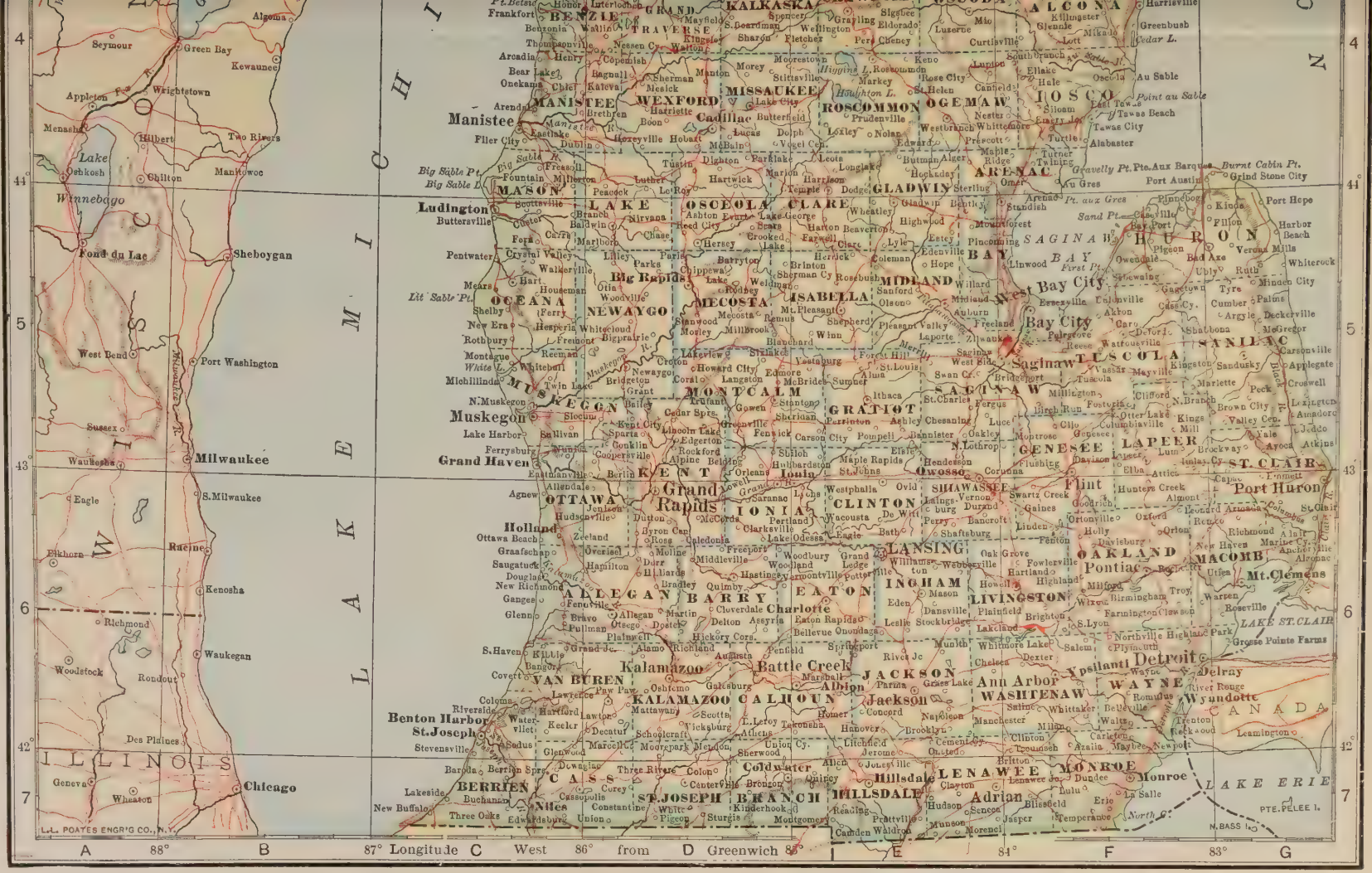
Topography. The northern peninsula is divided naturally into two provinces, one of considerable relief to the west of the meridian of Marquette and one of low relief to the east. The western part of the northern peninsula consists for the most part of a table-land 1600 to 1800 feet above the sea, or 1000 to 1200 feet above the level of Lake Superior (602 feet in altitude). Above this table-land rise many rocky knobs and ridges, some locally termed mountains, varying in height from 200 to 300 feet. Porcupine Mountains in the western part of Ontonagon County, on the border of Lake Superior, reach an altitude of 2000 to 2100 feet. These mountains are the highest and most conspicuous physiographic feature of the State. The eastern part of the northern peninsula is in general much lower in elevation and has less relief than the western. Much of the surface is ancient lake bottom. In the south and in the northwest there are low table-lands. The table-land in the south is of limestone (Niagara limestone), analogous in origin and topographic features to the Niagara escarpment in western New York. The table-land in the northwest, in Alger County and eastern Marquette County, is of sandstone. The north clifflike face, in places rising 100 to 200 feet sheer from the water surface of Lake Superior, and colored in shades of red, brown, and gray, and weathered and eroded into fantastic forms, constitutes the famous "pictured rocks" of Lake Superior.

The average altitude of the southern peninsula is estimated at about 850 feet, or 270 feet above the level of lakes Huron and Michigan (581 feet in altitude). The northern portion of the southern peninsula is occupied for the most part by a broad table-land bordered by gentle slopes. The surface of this table-land is from 1000 to 1200 feet above sea level. The highest point in the southern peninsula is a few miles southeast of Cadillac. Here two hills have altitudes of more than 1700 feet. A broad ridge of land in southeast Michigan extends from the southern boundary of the State in Hillsdale County northeastward as far as Sanilac County. Many square miles in this ridge are more than 1000 feet above the sea. The surface of this tract is very rough, hills and ridges alternating with lake-filled basins. The remainder of the surface of the southern peninsula has flat or rolling topography. Lake plains from 5 to 40 miles wide extend along the eastern border of the peninsula from Alpena southward to the Ohio boundary. Hills of sand (dunes) occupy a narrow belt along much of the west shore of the southern peninsula.

Hydrography. Michigan has no large rivers. Few of the rivers are navigable, except in their lower courses where the United States government has made improvements, by even small vessels. Many will furnish abundant water power when the power possibilities are fully developed. The numerous lakes and swamps and loose soil tend to give to the rivers a nearly continuous flow. Most of the drainage of the northern peninsula is tributary to Lake Michigan. The Menominee, Manistique, and Ontonagon rivers are the more important. The Menominee River has numerous power sites. One at White Rapids develops 8500 horse power from a 50-foot fall.

The drainage of the southern peninsula is about equally divided between east-flowing and west-flowing streams. The Saginaw basin (area 6250 square miles), the largest in the southern peninsula, is made up of several widely branching rivers. These rivers were an invaluable aid in concentrating the lumber industry in the Saginaw valley for so many years. Down them floated millions of feet of logs to the mills at Saginaw and Bay City. The United States government has spent more than $1,000,000 in dredging the Saginaw River, as far up as Saginaw, to a depth suitable for lake vessels. Grand River (drainage area 5600 square miles) furnishes water power at several points along its course. The lower course from Grand Rapids to the lake has been improved by the United States government so that it is navigable for small steamers. About $1,000,000 has been expended to provide a deep harbor at Grand Haven. The other important rivers are the St. Joseph, Kalamazoo, Muskegon, Manistee, Cheboygan, Thunder Bay, Au Sable, Huron, and Raisin. Most of

MICHIGAN
SCALE OF STATUTE MILES
0 5 10 20 30 40 50 60
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80
County Towns
Railroads
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
NORTH PASSAGE
MANITOU I.
KEWEENAW
Calumet
Laurium
Hancock
KEWEENAW BAY
BARAGA
MARQUETTE
Marquette
Negaunee
Ishpeming
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
Sault Ste. Marie
MACKINAC
DELTA
Escanaba
Manistique
DICKINSON
IRON
Iron Mountain
Norway
MENOMINEE
Menominee
GOGEBIC
Ironwood
ONTONAGON
MINERAL RANGE
EMMET
CHEBOYGAN
Cheboygan
PRESQUE ISLE
Alpena
CHARLEVOIX
Petoskey
MONTMORENCY
GRAND TRAVERSE BAY
NORTHWEST PART OF MICHIGAN
Same scale as main map
DOMINION OF CANADA
MICHIGAN
ISLE ROYAL
LAKE SUPERIOR


LAKE MICHIGAN
LAKE ERIE
CANADA
ILLINOIS
WISCONSIN
Longitude West from Greenwich
88°
87°
86°
85°
84°
83°
44°
43°
42°
Green Bay
Milwaukee
Chicago
Grand Rapids
Kalamazoo
Battle Creek
Lansing
Flint
Saginaw
Bay City
Detroit
Port Huron
Ann Arbor
Ypsilanti
Pontiac
Muskegon
Grand Haven
Holland
Benton Harbor
St. Joseph
Manistee
Ludington
Sheboygan
Port Washington
Racine
Kenosha
Waukegan
Mt. Clemens
Monroe
Adrian
Jackson
Alpena
Cheboygan
Petoskey
Traverse City
Cadillac
Big Rapids
Alma
Ionia
Owosso
Hillsdale
Coldwater
Niles
Three Oaks
Lake Michigan
Lake Huron
Lake St. Clair
Lake Erie
Pte. Pelee I.
North Cape
N. Bass I.
L.L. POATES ENGR'G CO., N.Y.

these rivers have been dredged for short distances in their lower courses to make them navigable for lake vessels, and hydroelectric plants have been located along most of them.

Geology. Michigan lies within the glaciated area of North America and for the most part the bed rock is deeply buried in glacial drift. The area of bed rock exposures (little or no drift) is less than 9 per cent of the area of the State. The bed rock of the State includes all the systems of Pre-Cambrian and nearly all the Paleozoic series.

Pre-Cambrian rocks in Michigan occur as bed rock only in the western part of the northern peninsula, west of the meridian of Marquette. These rocks—schists, gneisses, granites, conglomerates, and slates—and rich deposits of iron ore and copper have been folded and faulted and metamorphosed by pressure and igneous intrusions and extrusions, so that their structure is complex. They differ greatly in hardness. This has resulted in unequal weathering and degradation and, consequently, in a rugged topography. Much of this area is bare rock. Glacial drift partly fills the depressions.

Paleozoic rocks outcrop or underlie the glacial drift in the remainder of Michigan. These rocks are arranged like a pile of saucers in a series of diminishing sizes from bottom to top. Only the rims of the "saucers" are exposed at places. The oldest of the series, the Cambrian, underlies the surface deposits in the northern part of the northern peninsula from Sault Ste. Marie westward to Marquette, and gives rise to the rapids of the St. Mary's River and the sandstone table-land in Alger and Marquette counties. The youngest of the series (Pennsylvanian, containing coal seams) outcrops, or is reached by, wells and mine shafts, in a large area in the central part of the southern peninsula. The arrangement of the strata is such that gypsum is quarried or mined from the same formation at Alabaster, on Saginaw Bay, and at Grand Rapids. The same limestone is quarried at Alpena and Petoskey, and could be quarried in southeast Michigan but for the thick drift. The Paleozoic rocks in general are more easily eroded than the Pre-Cambrian. The location, shape, and size of lakes Michigan, Huron, and Erie, Green Bay and Georgian Bay, as well as some of the lowlands of the Lakes region, are undoubtedly due to differential erosion of the Ordovician, Silurian, and Devonian formations.

Climate. Michigan lies in the interior of the continent, partly in the cold temperate belt (with extreme winters and mild summers) and partly in the warm temperate belt (with cold winters and hot summers). Its position would naturally give it a high range of temperatures, daily, monthly, and annual; but owing to the tempering influence of the lake waters its climate for the most part is markedly insular. The climate is characterized by frequent changes of temperature, wind direction, and moisture conditions. The mean annual temperature for the State as a whole is 44° F. (48° F. for the southern counties of the State and 39° F. for the northern). The average summer maximum for the interior of the southern peninsula is 85° to 90° F.; for the lake shore counties, 80° to 85°. The extreme maximum temperature occasionally exceeds 100° F. Hot spells rarely last more than one or two days. The average winter minimum is about 0° F. for the northern peninsula and 10° F. for the southern peninsula.

At Marquette in the northern peninsula the average temperature for the coldest month, January, is 16° F.; for the warmest month, 65° F. Cheboygan has a February mean (coldest month) of 16° F., a July mean of 66° F. Detroit has a January mean of 25° F. and a July mean of 72° F.; Grand Haven, a January mean of 24° F. and a July mean of 69° F.

In the northern peninsula frosts may occur every month in the year, but summer frosts even in the interior are not severe. In general the growing season is from 90 to 120 days. The southern peninsula is free from frost on the average from May 1–15 to October 1–10—about 160 days in the southern counties and 130 days in the northern. The lakes tend to prolong the cold season and thus retard the early budding of fruit trees, check the occurrence of late frosts, and prolong the warm season into the autumn.

Michigan is well supplied with rain. The average precipitation is about 33 inches and is fairly evenly distributed over the State. About one-third of the rainfall comes in the growing season, May, June, and July. Snow covers the ground for five to six months on the average in the northern peninsula, about three to five in the southern peninsula.

Soils. The soils of Michigan are wholly glacial or fluvioglacial in origin, and wholly unlike the bed rock in chemical composition. Only in a few areas in the State has bed rock been incorporated in the overlying or near-by soil. In the southern peninsula the soils vary in thickness from a few inches to 700 or more feet; the average thickness is about 200 to 300 feet. According to Leverett 12 per cent of the southern peninsula is covered by swamp and lakes; about 56 per cent has a sandy or gravelly soil and 33 per cent clay soil. Much of the sandy areas has a subsoil of clay. In the southern part of the southern peninsula almost the entire area is in productive farms. Some counties in the northern half have less than 10 per cent of the area in farms, mainly because of thin and sandy soils. In the northern peninsula swamps and lakes cover 25 per cent of the area; about 30 per cent has sandy soil, 20 per cent clay soil, and 10 per cent thin soils. Thin soils and large areas of swamp and the short growing season explain in part the retarded agricultural development. At present in 12 of the 15 counties of the northern peninsula less than 10 per cent of the area is in farms.

Mining. In 1913 Michigan ranked eighth among the States in the value of its mineral production. It owes this prominence to its great wealth in two metals—copper and iron. In the production of iron ore it ranked second, being exceeded only by Minnesota; and in the production of copper fourth, being exceeded by Arizona, Montana, and Utah. The mining of copper in Michigan antedates the earliest visits of European explorers to the region. The production on a commercial scale, however, dates from 1845, since which time the State has been a steady producer and an important factor in the copper industry of the world. To the close of 1913 Michigan had produced 5,361,432,892 pounds of copper, or 28.43 per cent of the output from the United States since 1845. In total output it is second only to Montana. The mining of copper is limited to the Keweenaw or Lake Superior district. Previous to the perfection of the electrolytic process of refining,

"Lake" copper enjoyed the distinction of being the highest grade produced, and even to the present time it sells at a figure slightly higher than the copper from other districts. Although the copper district has been an active producer for 65 years, most of the older mines still have large reserves of ore and new mines are being opened, while much of the territory remains to be prospected. The Lake Superior region is unique in being the only district from which a large output is derived from native copper. (See *Geology*, above.) The native copper occurs in the lodes in masses varying from microscopic size to bodies weighing hundreds of tons. The production of refined copper in Michigan in 1912 was 231,112,228 pounds. In 1913 the production was 155,853,409 pounds, valued at $21,057,278. The great decrease in the output was due to labor troubles. The iron ores of Michigan, as of the other two States included in the Lake Superior region (Minnesota and Wisconsin), are hematites of Bessemer grade. In 1882 the Marquette and Menominee ranges were the only ones opened in the Lake Superior region. The production in the region in that year was a little short of 3,000,000 long tons, most of which was from Michigan. The Gogebic range was opened in 1884, as was also the Vermilion range, in Minnesota. The Mesabi range, in Minnesota, now the greatest iron producer in the world, was opened in 1892, but Michigan continued to lead in the production of iron ore until the first year of the twentieth century. The production of iron ore in the State in 1913 was 12,668,560 long tons, valued at $33,479,954.

The coal fields occupy an isolated area in the lower peninsula. It is only since about 1900 that these mines have been developed to a considerable extent, and whatever importance this industry has obtained is due to the decline of the lumber industry. In earlier years the refuse of the lumber mills furnished the principal fuel for the salt works, but the exhaustion of the forests and the decline of the lumber industry has created a demand for coal to supply the salt works and for the other manufacturing plants. The maximum production of coal was in 1907, when 2,035,858 tons were produced. The production in 1913 was 1,231,786 short tons, valued at $2,455,427.

Michigan ranks among the most important States in the manufacture of cement, which is third in importance among the State's industries. There were produced 4,081,281 barrels in 1913, valued at $4,228,879. In the value of the salt production Michigan and New York have for many years alternated as first in rank. In 1913 Michigan held first place. The salt production (exclusive of rock salt) amounted to 10,829,307 barrels, valued at $3,054,532 in 1913. At the time when salt making was subsidiary to the lumber industry the plants were largely located along the lake shore in Bay and Saginaw counties.

The principal clay products are common brick and drain tile. The value of the clay products was $2,674,125 in 1913. The mining and calcining of gypsum is an industry of considerable importance. There are produced also important quantities of sand and gravel. The principal quarry product is limestone, the value of which in 1913 was $1,408,708. Other commercial mineral products are occasional gems, lime, manganiferous ore, mineral paints, mineral waters, natural gas, petroleum, quartz, scythestones, and silver. The total value of the mineral products in 1913 was $72,143,211.

Agriculture. The soils of the south central and southwestern part are well suited to the production of corn, winter wheat, oats, and grass, while in the vicinity of the lakes much soil is especially suited to the production of sugar beets. In the northern part of the lower peninsula and in a limited portion of the upper peninsula are soils well suited to the production of Irish potatoes, buckwheat, rye, and clover. On the drained swamp lands that lie along the margins of lakes and rivers are many acres used for growing sugar beets, celery, onions, and cabbages.

The total number of farms in 1910 was 206,960. Of an approximate land area of 36,787,200 acres, the land in farms in 1910 was 18,940,614 acres. The improved land in farms in 1910 was 12,832,078 acres. The average acreage per farm was 91.5 in 1910. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry and bees, was, in 1910, $1,088,858,379. The average value of all property per farm was $5261 in 1910. Of the total number of all farms (206,960) in 1910, 174,271 were operated by owners and managers. In 1910 more than one-third of all Michigan farms were between 50 and 99 acres in size.

The native white farmers in 1910 numbered 147,790, the foreign-born white farmers 58,224, and the negro and other nonwhites 946. Of the foreign-born white farmers the greatest number were born in Canada.

The table below shows the acreage, value, and production of the principal crops in 1914. The figures are estimates of the United States Department of Agriculture.

PRODUCTS	Acreage	Prod. bu.	Value
Corn	1,750,000	63,000,000	$42,210,000
Wheat	879,000	17,316,000	17,835,000
Oats	1,515,000	50,752,000	22,838,000
Barley	90,000	2,340,000	1,521,000
Rye	371,000	5,936,000	5,402,000
Buckwheat	57,000	1,054,000	748,000
Potatoes	364,000	44,044,000	13,213,000
Hay	2,352,000	*3,011,000	36,132,000

* Tons.

The total value of crops in 1909 was $162,005,000, and the combined acreage of crops for which acreage was reported was 8,198,578, representing 63.9 per cent of the total improved land in farms. The general character of agriculture is indicated by the fact that more than two-fifths of the total value of crops in 1909 was contributed by the cereals, more than one-fifth by hay and forage, and one-tenth by potatoes and other vegetables. In 1909 hay and forage was the leading crop; its acreage amounted to 2,715,301 and the production to 3,632,930 tons. The acreage of corn in that year was 1,589,596 and its production 52,906,842 bushels. The other leading crops, oats, wheat, and rye, had acreages of 1,429,076, 802,137, and 419,020 and produced 43,869,502, 16,025,791, and 5,814,394 bushels respectively. Aside from the cereals and hay and forage, the two most important crops were beans and potatoes.

The manufacture of cereals into prepared foods, which in recent years has become one of the leading industries, has resulted in greatly

increased acreages of corn, wheat, and other cereals.

The total acreage of potatoes and other vegetables was, in 1909, 456,368 and their value was $16,201,328. Excluding Irish potatoes and sweet potatoes and yams, the acreage of vegetables was 90,861 and their value was $6,287,000. As noted in the first part of this section large areas of land in Michigan are especially adapted to the growing of sugar beets, and this has become one of the most important agricultural industries. In the acreage and production of sugar beets Michigan is second, being surpassed only by Colorado. In 1909 the acreage planted to sugar beets was 78,779. The product amounted to 707,639 tons, valued at $4,014,123. The area planted to this product in 1913 was 107,965 acres, and the production 955,242 tons. There were, in 1913, 15 sugar-beet factories in operation. The refined sugar made from the raw product in that year amounted to 122,424 short tons.

Orchard fruits in large quantities are grown. The value of these products in 1909 was $9,020,842. The most important of these fruits was apples, of which 12,332,296 bushels, valued at $5,969,080, were grown. Large quantities of grapes are also grown. These in 1909 amounted to 120,695,997 pounds, valued at $1,531,057. Of small fruits, the total value in 1909 was $2,028,865, and of these 27,214,659 quarts were grown. The most important of these fruits is the strawberry. Michigan is one of the leading States in the growing of celery. Portions of its soil are particularly adapted to the growing of this vegetable. The State also produced the greater part of the peppermint and chicory grown in the United States.

Live Stock and Dairy Products. The growing of live stock has been superseded in importance by mining and the growing of fruits, vegetables, and other agricultural commodities. The total value of live stock of all kinds in 1910 was $137,803,795, and of domestic animals, $131,746,348. On Jan. 1, 1915, the estimated number of cattle other than milch cows was 707,000, valued at $21,069,000; milch cows, 814,000, valued at $49,247,000; horses, 673,000, valued at $88,836,000; mules, 4000, valued at $524,000; sheep, 2,033,000, valued at $10,165,000; swine, 1,392,000, valued at $15,173,000. Poultry of all kinds numbered in 1910 9,967,039, valued at $5,610,958. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $26,727,538. The milk sold was 74,025,769 gallons, and the butter sold amounted to 30,010,783 pounds.

Fisheries. Owing to its favorable position on four of the Great Lakes, Michigan ranks first among the Great Lake States in the value of its fishery products. There are no statistics of this industry prior to 1890, but in general it shows signs of growing importance. In all there are at least 23 species of fish caught, but lake trout, whitefish, lake herring, suckers, and various pike perches constitute, in the order named, the most important products. There were, in 1908, 3472 persons and 97 vessels of 1407 aggregate tonnage engaged in fisheries. The capital invested was $2,013,000. To the total value of products of $1,473,000 Lake Michigan contributed, in 1908, $661,000 and Lake Huron $486,000.

Forest Products. The lumber and timber industry dates from 1834, when the first steam saw mill was built in the Saginaw valley. Its growth thereafter was very rapid, and in 1849 there were 558 establishments reported, which employed an average of 2730 wage earners and turned out products valued at $2,464,000. The industry was at first concentrated along the borders of the Grand, Saginaw, and Muskegon rivers and their tributaries, and at certain of the lake ports. In former years the greater portions of the forest were conifers, though hard woods were intermingled with those in the South. White pine was originally the most abundant variety of wood, but the forests of this wood have been greatly depleted and this has necessitated the utilization of other woods, of which the State has a considerable supply. In 1909 the combined output of soft wood formed only little over one-half of the total cut. Hemlock contributed over two-thirds, and white pine only about one-fourth of the soft wood, while small quantities of spruce, cedar, tamarack, and balsam fir were also reported. Maple was by far the most important of the hard woods, while beech, basswood, birch, elm, and oak constituted most of the remainder. In 1909 the State ranked first in the cut of maple and beech. The method of exploiting the forests of the State has in past years been extremely wasteful. In recent years, however, a sentiment in favor of the adoption of improved methods of forestry has arisen, and a commission has been created to secure better protection of the forests. The total cut of rough lumber in 1909 was 1,889,724 M feet. There were cut also 218,308 thousands of lath and 891,649 thousands of shingles. In addition to these figures, forest products valued at $7,911,901 were produced on the farms of the State.

Manufactures. The growth of the manufacturing industries has been closely related to the development of the transportation facilities. Its advance dates from about 1825, when the Erie Canal was opened, affording connection with the eastern seaboard. Michigan's position on four of the Great Lakes, with the attendant facilities for water transportation, has been a great factor in establishing its position as one of the leading manufacturing States in the Union. There were, in 1910, 24 cities with a population of over 10,000. These, while containing but 37.1 per cent of the population, were credited with 88.5 per cent of the total value of its manufactures. The value of its manufactured products in 1849 amounted to $11,169,000; by 1869 it had increased to $118,395,000; and in 1909 it amounted to $685,109,000. The early development of manufactures was due largely to the utilization of its extensive forests, while the growing markets afforded by the rapidly developing West, the advantageous situation of the State with respect to the markets of both the East and the West, and its important agricultural and mineral resources have also been influential factors in its later progress. The table on page 586 gives the most important figures relative to the 10 leading manufactures for 1909 and 1904, as reported by the Bureau of the Census.

There were, in 1909, 58 industries for which products valued at more than $1,000,000 were reported. In addition to this there were 13 other industries with a product valued at this amount, which are not included in the table, because the operations of individual establishments would be disclosed if they were shown separately. Among such industries are the

smelting and refining of copper, which is among the leading industries. The manufacture of cash registers and calculating machines is another important industry for which separate statistics cannot be presented. This industry centres in Detroit and has developed almost entirely since 1904.

The manufacture of automobiles, including bodies and parts, is the most important single industry as measured by value of product. The manufacture of automobiles in Michigan on any considerable scale began in Detroit about the beginning of the twentieth century, although it had been carried on to a limited extent prior to that time. The industry developed rapidly, and by 1904 Michigan had become the leading State in the manufacture of automobiles, which position it held in 1909. In the latter year the State contributed 38.8 per cent of the total value of products for this industry. In 1909 there were produced 64,800 machines of all kinds, valued at $70,359,749, compared with 9125 machines, valued at $6,552,804 in 1899. The increase in production has been great since 1909 and has increased each year. In Detroit are located several of the largest manufactures of automobiles and parts. Industries connected with lumber and timber products are second in value of products. (For a more detailed account of this industry see the paragraph *Forest Products*, above.) In 1909 Michigan was the second State in the Union in the manufacture of furniture and first in the manufacture of refrigerators alone. The importance of the industry is due largely to the abundant available supply of pine and hard wood suitable for such manufactures. While the supply of such woods has diminished of late, the quantity of high-grade lumber imported has increased largely, and the industry has maintained the impetus afforded by its early natural advantages and has continued to prosper. Other leading industries are printing and publishing, manufactures of tobacco, tanning and currying of leather, manufacturing of paper and wood pulp, manufacturing of brass and bronze products, the manufacture of patent medicines and compounds and druggists' preparations, the manufacture of chemicals, and the manufacture of carriages and wagons and materials. The great development of the paper and wood pulp industry has been due to the more extensive use of wood pulp in the manufacture of paper. Other industries in addition to those mentioned in which Michigan holds high rank are the manufacture of stoves and furnaces and of corsets, the salt industry, wood distillation, and the manufacture of fur goods, show cases, and wall plaster.

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	Persons engaged in industry: Total	Persons engaged in industry: Wage earners (average number)	Capital	Wages	Value of products	Value added by manufacture
					Expressed in thousands			
All industries	1909	9,159	271,071	231,499	$583,947	$118,968	$685,109	$316,497
	1904	7,446	200,196	175,229	337,894	81,279	429,120	199,039
Automobiles, including bodies and parts	1909	113	28,098	25,444	52,926	15,491	96,651	42,769
	1904	33	2,953	2,735	4,347	1,268	7,997	4,554
Butter, cheese, and condensed milk	1909	435	1,740	1,073	3,434	554	14,287	1,910
	1904	371	1,301	875	1,888	432	8,209	1,182
Flour-mill and gristmill products	1909	520	2,623	1,530	11,147	806	34,861	5,502
	1904	405	2,353	1,508	7,654	767	26,512	3,098
Foundry and machine-shop products	1909	654	25,334	21,649	48,065	12,344	45,399	26,688
	1904	452	18,604	16,396	23,167	8,657	31,434	17,348
Furniture and refrigerators	1909	202	18,299	16,610	28,222	8,300	28,642	16,924
	1904	142	15,602	14,565	17,768	6,468	20,502	11,862
Leather, tanned, curried, and finished	1909	24	2,440	2,291	12,012	1,133	15,331	3,210
	1904	25	1,852	1,747	6,861	866	9,340	2,069
Lumber and timber products	1909	1,180	39,011	35,627	57,290	16,298	61,514	32,472
	1904	1,058	37,124	34,193	48,771	15,995	57,217	32,488
Paper and wood pulp	1909	32	4,581	4,327	15,754	2,142	13,922	4,897
	1904	30	3,221	3,052	8,398	1,306	7,341	2,760
Printing and publishing	1909	1,045	11,048	7,219	13,725	4,000	17,348	12,413
	1904	937	8,650	5,999	9,079	2,981	12,050	8,626
Tobacco manufactures	1909	729	9,242	7,876	6,837	3,076	16,179	8,971
	1904	706	7,619	6,428	4,147	2,467	11,864	7,017

The total number of wage earners in the State in 1909 was 231,499, of whom 199,298 were males. The wage earners under 16 years of age numbered 2517, of whom 1521 were males. For nearly one-half of the wage earners employed in the industries of the State the hours of labor in 1909 were 60 a week.

There were two cities, Detroit and Grand Rapids, with a population of 100,000 and over, and these were the principal manufacturing cities. The average number of wage earners in Detroit in 1909 was 81,011, and the value of the manufactured products was $252,992,123. The manufacture of automobiles is by far the most

important single industry of the city. In Grand Rapids there were, in 1910, 17,590 wage earners, and the value of manufactured products was $42,230,675. By far the most important industry is the manufacture of furniture. It is, in fact, the recognized centre of the furniture industry in the United States. Flint, the third city in value of manufactured products in 1909, owes its advance to the development of the automobile industry. Battle Creek was fourth. Its chief product is the manufacture of cereal or "breakfast" food preparations, the output of which was valued at $9,717,000 in 1909, outranking all other cities in the United States in this manufacture. Other cities, the value of whose product in 1909 was $10,000,000 or over, were Saginaw, Kalamazoo, Lansing, Jackson, and Bay City. Further information relating to the manufacturing industries of these cities will be found under their separate titles in other portions of this work.

Transportation. The transportation facilities, both by rail and by water, are excellent. In 1909, with 9059 miles of railroad, Michigan was the sixth State in the length of its trackage. The mileage of single track on June 30, 1914, was 8898.89. The State borders on four of the Great Lakes, which furnish intrastate and interstate communication by water. Detroit, located on the main lines of several of the most important railroad systems connecting the Eastern States with the Middle West, and near the western end of Lake Erie, is particularly well situated as a commercial centre. The Great Lakes are connected by canals, and in addition a short canal connects the northern end of Lake Portage with Lake Superior. The New York Central and Hudson River system operated 1951 miles on June 30, 1914. The chief roads of this line in the State and their mileage on that date are the Michigan Central, 1199, and the Lake Shore and Michigan Southern, 587. The Grand Trunk system, of which the longest road in the State is the Grand Trunk Western (236 miles), operated 881 miles of main track. Other important roads with their mileage of single track were: Père Marquette, 1820; Chicago and Northwestern, 520; Duluth, South Shore and Atlantic, 509; Grand Rapids and Indiana, 429; Detroit and Mackinac, 400; Ann Arbor, 295; Minneapolis, St. Paul, and Sault Ste. Marie, 248; Chicago, Milwaukee, and St. Paul, 245.

Banks. The Bank of Michigan, organized in Detroit in 1817, was the first in the Territory. It incurred large losses in the panic of 1837–38, and was placed in the hands of trustees for liquidation in 1842. In 1835, shortly before Michigan was admitted as a State, nine new banks were organized. The free banking law of 1837 was the first in the United States to put into practice the system of securing the circulation of banks by deposit of collaterals. It also provided for examination of banks by bank commissioners. The law was imperfectly administered, however, and, in 1839, 42 banks were in the hands of receivers, and more than a million dollars of bills became worthless. In 1844 the banking law was declared unconstitutional. The banking system of the State did not recover from this depression for many years, and the banking business was carried on mainly by brokers and private bankers. In 1857 a new banking law was adopted, similar to the law of New York. On Sept. 12, 1914, there were 100 national banks with a capital of $17,069,730; surplus, $9,052,193; cash, etc., $2,993,101; loans, $114,304,546, and deposits, $140,851,238; 270 State banks with a capital of $14,469,800; surplus, $7,140,910; cash, $14,032,151; loans, $128,704,861, and deposits, $160,520,674.

Government. The present constitution was adopted by a constitutional convention on Feb. 21, 1908, and was ratified by the electors on November 3 of the same year. The original constitution was adopted in 1835. The second constitution was framed and adopted in 1850, when many features, radical for the time, were introduced. Amendments to the constitution may be proposed in either branch of the Legislature. If agreed to by two-thirds of both houses, they are submitted to the people at the next election, and become part of the constitution if ratified by a majority of the electors qualified to vote for members of the Legislature. Under a constitutional amendment ratified in 1913, amendments may also be proposed by petitions of not less than 10 per cent of the qualified electors, filed with the Secretary of State at least four months before election. Another amendment, also ratified in 1913, provides that statute laws may be enacted by the initiative and referendum.

Legislative.—The legislative power is vested in a Senate and a House of Representatives. The Senate consists of 32 members, who are elected for two years and by single districts. The House of Representatives consists of not less than 64 nor more than 100 members. The apportionment acts since 1861 have all fixed the number at 100. Representatives are chosen for two years and by single districts. Every 10 years, beginning with 1913, the Legislature is required by law to rearrange the senatorial districts and apportion anew the representatives among the counties and districts according to the number of inhabitants. The election of Senators and Representatives is held on the Tuesday succeeding the first Monday of November of every second year, dating from 1910. The Legislature meets on the first Wednesday in January of every second year, dating from 1909.

Executive.—The executive officers are a Governor, Lieutenant Governor, Secretary of State, State Treasurer, Auditor General, and Attorney-General. They are elected at each general biennial election for a term of two years. The chief executive power is vested in the Governor. No person is eligible to office of Governor or Lieutenant-Governor who has not attained the age of 30 years and who has not been five years a citizen of the United States and a resident of the State two years next preceding his election. The Lieutenant Governor is president of the Senate, but has no vote. The Secretary of State, State Treasurer, and Superintendent of Public Instruction constitute a board of State auditors, with the duty of examining and adjusting all claims against the State not otherwise provided by general law. They also constitute a board of State canvassers to determine the results of all elections of State officers. The same officers act as a State board of escheats and a board of fund commissioners.

Judiciary.—The judicial powers are vested in a supreme court, circuit courts, probate courts, justices of the peace, and such other courts of civil and criminal jurisdiction inferior to the supreme court as the Legislature may establish.

The supreme court consists of one chief justice and seven associate justices. The State is divided into judicial districts, in each of which there is elected one circuit judge, unless the Legislature provides for more. They are elected on the first Monday in April, dating from 1911, and serve for six years. In each county organized for judicial purposes there is a probate court. In addition to the ordinary powers these courts have original jurisdiction in all cases of juvenile delinquents and dependents. Judges of probate are elected in the counties in which they reside and hold office for four years.

Suffrage and Elections.—All males 21 years old or over who have resided in the State six months, and in the township or ward 20 days prior to the day of election, and who are included in one or more of the following categories are entitled to vote: (1) citizens of the United States; (2) those who were residing in the State on June 24, 1835; (3) foreigners who have resided in the State and who have, two years and six months prior to Nov. 8, 1894, declared their intention of acquiring citizenship; (4) civilized Indians who are natives of the United States. There is a primary election law, amended in 1913. All nominations must be made on the last Tuesday in August. Party candidates for United States Senator are also nominated at the primaries, and there is a provision for a presidential preferential primary. (See *History*, below.) A constitutional amendment was ratified in April, 1913, which provides for the recall of all elective public officers excepting judges of the courts. Women have the right to vote for members of school boards, and, if taxpayers of legal age, on questions involving the direct expenditure of public money or the issue of bonds.

Local and Municipal Government.—Each organized county is a body corporate, with such powers as shall be established by law. Each county may have a board of jury commissioners to be appointed by the Governor if it so votes. A board of supervisors, consisting of one from each organized township, has general charge of the administration of counties. Cities have such representation in the board of supervisors of the counties in which they are situated as may be provided by law. No county may incur an indebtedness which shall increase its total debt beyond 3 per cent of its assessed valuation. Each organized township is a body corporate, with such powers and immunities as may be prescribed by law. Each city and village has power and authority to frame, adopt, or amend its charter, and, through its regularly constituted authority, to pass all laws and ordinances relating to its municipal concerns, subject to the constitution and general laws of the State. Cities or villages may acquire, own, and operate their public utilities.

Miscellaneous Constitutional and Statutory Provisions.—Corporations may be formed under general laws, but shall not be created, nor shall any rights or privileges or franchises be conferred upon them, by special act of the Legislature. No corporation shall be created for a longer period than 30 years except for municipal, railroad, insurance, canal, or cemetery purposes, or corporations organized without any capital stock for religious, benevolent, social, or fraternal purposes. The Legislature may establish courts of conciliation, with such duties and powers as may be prescribed by law. Minors under 21 years of age may not be employed more than 60 hours in any one week, save in exceptional circumstances. There is an employers' liability law. Michigan is under county local option law and, under this, cities and towns vote annually for license or no-license. In 1909 a search and seizure law was enacted by the Legislature. The Legislature of 1913 passed a measure prohibiting the drinking of alcoholic liquors on trains other than dining cars, and prohibiting drunken men from riding on trains. The same Legislature passed what is known as the Pray Law. This prohibits the shipment of liquor designed for illegal purposes into dry territory, and is supplementary to the national Webb Law.

Finance. The first Legislature authorized in 1837 a loan of $5,000,000, which was to be devoted to public improvements. Only a small portion of the bonds were sold direct and paid in full. About two-thirds of them were deposited by the United States Bank of Pennsylvania, which failed in 1841 after selling some of the bonds. The State became liable for interest on these bonds, for which it never received any payment. It could not meet the interest payment in 1842, and an adjustment was reached which amounted to a partial repudiation of the State debt. In 1861 the debt was $2,316,328, which was increased during the war to $3,880,399. This, in 1880, fell to $905,150, and was decreased 10 years later to $10,993. In 1905 this debt was entirely paid off. By the Constitution of 1908, the State may contract debts to meet deficits in revenue, but such debts shall not in the aggregate at any time exceed $250,000. The funded debt on June 30, 1913, was $6,896,212. It consisted solely of special debt obligations to public trust funds, which were derived from the sale of all lands given by the United States to the State for educational purposes. The State has used these moneys for the expenses of the government, and pays interest to the various funds for the use of the same. The floating debt on June 30, 1913, was $192,880, which was composed of private trust funds in the form of various deposits. The total receipts for the fiscal year 1913 amounted to $13,434,472, and the disbursements $13,165,468. The balance at the beginning of the fiscal year was $8,980,404, leaving a balance at the end of the year of $9,249,408. The chief sources of revenue are the State tax, railroad tax, telephone and insurance taxes. The chief expenditures are for primary schools and educational and charitable institutions.

Militia. The organized militia consists of one brigade of infantry including the first, second, and third regiments, two troops of cavalry, a battalion, field artillery, a company of engineer corps, a company of signal troops, and companies of sanitary troops with a field hospital. The total strength of enlisted men in 1913 was 2551, the officers numbered 199. The males of militia age in the State in 1910 numbered 616,739.

Population. The population at various periods is as follows: 1810, 4762; 1830, 31,639; 1840, 212,267; 1850, 397,654; 1870, 1,184,059; 1890, 2,093,890; 1900, 2,420,982; 1910, 2,810,173. The est. pop. on July 1, 1914 was 2,976,030; 1920, 3,668,412. The State rose from twenty-seventh rank in 1830 to eighth in 1910. There were 48.9 persons to the square mile in 1910. The fertile prairie region of the south was the first portion settled, and the majority of the population is still

found in the southern half of the lower peninsula. The population, however, is steadily increasing in the more northern regions. The early settlers were largely from New England and New York, but a large German element made settlements about the middle of the nineteenth century. The nearness to Canada has resulted in a large Canadian element, greater than that of any other State except Massachusetts. The total white population in 1910 was 2,785,247. The native white population in 1910 was 1,224,841. The native whites of foreign or mixed parentage in 1910 numbered 964,882. The population in 1910 was divided by sexes into 1,454,534 males, and 1,355,639 females. The males of voting age in 1910 numbered 870,876. Detroit, the largest city, had in 1910 a population of 465,766. The estimated population of Detroit in 1914 was 537,650. Other large cities with their estimated populations in 1914 are as follows: Grand Rapids, 123,227; Saginaw, 52,988; Bay City, 47,047; Kalamazoo, 45,842; Flint, 49,546; Jackson, 34,097; Lansing, 37,512; Battle Creek, 28,122; Muskegon, 25,442; Ann Arbor, 14,948; Sault Ste. Marie, 13,499.

Education. Michigan has always been among the foremost States in the maintenance of high educational standards. The percentage of illiteracy in 1910 was only three and three-tenths per cent, and among the native white population it was only one per cent. The total number of illiterates in that year, of 10 years of age and upward, was 74,800. Of these 54,113 were foreign-born whites.

The total school population, ages 6 to 20 years, in 1910, was 796,887; of these 539,739 attended school in that year. The statistics of the State Superintendent of Public Instruction for the year ending June 30, 1913, show a school population in that year of 815,849 with a total enrollment of 572,201. The total number of teachers employed was 17,987. The average monthly salary of men teachers was $79.07 and of women teachers $52.03.

The Legislature in recent years has been particularly active in passing new educational measures and in the revision of old ones. The compulsory education law passed in 1905 was revised in 1911. It now includes the compulsory education of deaf and blind children. The Legislature of 1913 passed a measure governing the sale of text books in the State. It is estimated that approximately $100,000 annually will be saved by the operation of this law. Teachers' institutes are held yearly and these have been an important factor in keeping teachers in touch with advanced movements along educational lines. The high schools have shown a remarkable growth. An effort has been made to adapt the courses of studies in these schools to the needs of the communities in which they are placed. Since the beginning of the county normal system in 1903–04 these schools have furnished for the State 5850 teachers.

The schools in general are in charge of the district boards, which are elected annually and which have the power to vote taxes for school purposes, except for the erection of schoolhouses or additions, purchase of sites, and the payment of tuition in excess of $20 per year per pupil. The board of any school district which does not maintain a legal high school must on application pay up to $20 a year for each qualified student to any high school in the State.

By means of the township unit system all the various districts are united into one district with one board of five members to conduct all the schools of the township, instead of many boards. Towns with a population of 900 or over may be exempt from the unit system. A child-labor law passed in 1909 and amended in 1911 contains strict provisions in regard to the employment of children of school age. Special attention is given to the education of the backward and feeble-minded. Classes are conducted in Detroit, Grand Rapids, and elsewhere and at Lapeer a training school is carried on each summer for teachers of backward and mentally defective children.

The school districts may establish a vocational school or a gymnasium, and physical training must be taught in public schools in city school districts with a population greater than 10,000 and in all State normal schools.

The State normal schools include the Western State Normal School at Kalamazoo, the Northern State Normal School at Marquette, the Central State Normal School at Mount Pleasant, and the Michigan State Normal College at Ypsilanti.

The University of Michigan, at Ann Arbor, is a part of the educational system, as are also the Michigan Agricultural College, at East Lansing, and the Michigan School of Mines, at Houghton. The other colleges include Adrian College at Adrian, Albion College at Albion, Alma College at Alma, Hillsdale College at Hillsdale, Hope College at Holland, Kalamazoo College at Kalamazoo, and Olivet College at Olivet. These are all coeducational. The University of Detroit is a college for men only, under the auspices of the Roman Catholic church.

Charities and Corrections. The charitable and correctional institutions are under the control of the Board of Corrections and Charities. These institutions include Kalamazoo State Hospital, Pontiac State Hospital, Traverse City State Hospital, Newberry State Hospital, Ionia State Hospital, the Michigan Home for the Feeble-Minded and Epileptic at Lapeer, the State prisons at Jackson and Lansing, the Michigan Reformatory at Ionia, the Industrial School for Boys at Lansing, the State Industrial School for Girls at Adrian, the State Public School at Coldwater, the Michigan School for the Deaf at Flint, the Michigan School for the Blind at Lansing, the Michigan Employment Institution for the Blind at Saginaw, the Michigan Soldiers Home at Grand Rapids, the State Sanatorium at Howell, an additional State sanatorium for the care and treatment of persons afflicted with tuberculosis, and a farm colony for the care and treatment of epileptics. There are also under the care of the board juvenile courts, county agents for the care of the poor, maternity hospitals, and child caring and placing agencies. There is a uniform probation law passed in 1913. The medical and surgical treatment of dependent children is provided for, and provision is also made for the medical treatment of children of indigent parents. Dependent and neglected children are educated and cared for at the State Public School and in other institutions approved by the State Board of Corrections and Charities. The State has a parole law for inmates of jails and prisons.

Religion. The Methodist and the Roman Catholic churches are in the lead, followed in the order named by the Lutherans, Baptists, Presbyterians, Congregationalists, and Protestant Episcopalians.

History. Remains of ancient mines and mining implements have been found within the present limits of the State. The white discoverers and first settlers were French missionaries and fur traders, some of whom visited the site of Detroit as early as 1610. In 1641 French Jesuits found their way to the falls of the St. Mary. The first actual settlement by Europeans within the limits of the State was the mission at Sault Ste. Marie, founded by Father Marquette and others in 1668. Three years later Michilimackinac (now Mackinac Island) was established. In 1679 and 1686 forts were built at the mouth of the St. Joseph and at the outlet of Lake Huron, and in 1701 Antoine de la Mothe Cadillac founded Detroit. Through the entire period of French occupation the town dragged out a painful existence, though the centre of a considerable fur trade and a place of meeting for friendly Indian tribes. The territory, with other French possessions, fell into the hands of the English at the end of the French and Indian War. Detroit was occupied in 1763, but early in May of that year the Indians, loyal to the French, rose under Pontiac (q.v.), massacred the garrison at Mackinac Island, and besieged Detroit for about five months. The English showed no capacity for government and the country made no progress under their rule. By the Quebec Act of 1774 the territory became a part of Canada, and during the Revolution Detroit was the starting point for many Indian expeditions which laid waste the American frontier. By the Treaty of Paris in 1783 the region passed to the United States, although England did not at once relinquish possession. After 1784 the Indians of the Northwest, deeming themselves unjustly treated by the Americans, waged a bloody warfare against the western settlements till they were brought to terms by General Wayne in 1795. By the treaty of peace concluded in that year they ceded large tracts of land on the eastern shore of the southern peninsula of Michigan and in the north to the United States. It was not until June 11, 1796, that the United States took actual possession of Detroit, though the region was included within the boundaries of the Northwest Territory, so called, and amenable to the Ordinance of 1787. In 1800 Ohio was set off from the Northwest Territory, including the eastern portion of Michigan, but in 1802 the whole of the lower peninsula was annexed to the Territory of Indiana. Its southern boundary was a line drawn east from the southerly extreme of Lake Michigan to Lake Erie. At that time the white population of Michigan was about 4000, consisting for the most part of Canadian traders and *coureurs de bois*. On June 30, 1805, Michigan was set off as a separate Territory, with substantially its present limits, and Gen. William Hull was appointed Governor. During the War of 1812 the inhabitants were harassed by the British and Indians; Mackinac was captured by the British; Detroit was surrendered by Governor Hull (q.v.); and at Frenchtown, in 1813, a number of American prisoners of war were massacred by the Indians. (For military operations during the War of 1812, see UNITED STATES.) At different times after 1814 the Indians ceded large tracts of land, and by 1836 all the lower peninsula and part of the upper peninsula had been freed from Indian title. Surveys were made as early as 1816, and in 1818 a large tract of land was put on the market. In 1819 the Territory was authorized to send a delegate to Congress, and in 1823 the system of rule by a Governor and three judges was replaced by that of a Governor and a council of nine, selected from 18 chosen by the people; in 1825 the council was increased to 13, and after 1827 the members were elected by popular vote. In 1835 a State constitution was adopted by a convention called for that purpose, but the admission of Michigan into the Union was delayed by a dispute with Ohio concerning the southern boundary. (See TOLEDO WAR.) There was danger that the dispute would lead to bloodshed, but in 1836 Congress agreed to admit Michigan upon condition that she should surrender her claim to the disputed territory and accept in lieu thereof a larger area in the upper peninsula. The first convention called to consider this proposal, Jan. 26, 1836, rejected it, but it was accepted by a second in December, 1836, and on Jan. 26, 1837, Michigan was admitted into the Union. Michigan has consistently supported the Republican party, except for three lapses—in 1882 and 1883, when the Democrats and Greenback party in fusion elected their candidate for Governor, and in 1890 when the Democrats alone carried the State.

The constitution was revised in 1908 and went into effect the following year. Michigan was a consistently Republican State from 1890 until the rise of the Progressive party in 1912 broke the Republican strength. In the presidential election of 1908 Taft received 335,580 votes compared with 175,771 for Bryan. Warner, the Republican candidate for Governor, was elected by a plurality of only about 10,000 votes. In 1910 a United States Senator was for the first time nominated at direct primaries. Charles E. Townsend defeated Julius C. Burrows for the nomination, and was elected by the Legislature in 1911. Chase S. Osborn, a Republican with strong Progressive leanings, was elected Governor in 1910. By 1912 the Progressive party had developed great strength. Governor Osborn was one of the seven governors who signed a letter urging Mr. Roosevelt to be a candidate for the nomination in that year. Roosevelt carried the State in the presidential election of 1912, receiving 219,012 votes compared with 154,244 for Taft and 150,751 for Wilson. The Democrats succeeded in electing their candidate for Governor, W. N. Ferris, but the remainder of the ticket was Republican. At the same election an amendment providing that amendments to the constitution could be made by the initiative and referendum without recourse to the Legislature and an amendment providing ways for the recall of all elective and public officials except judges were also passed.

Governor Ferris was reëlected in 1914, defeating Mr. Osborn, who was a candidate for reelection. The Progressive vote showed a falling off from 214,584 in 1912 to 36,747 in 1914. The following have been governors of the State:

TERRITORIAL

William Hull	1805–13
Lewis Cass	1813–31
George B. Porter	1831–34
Stevens T. Mason	1834–35
John S. Homer	1835–36

STATE

Stevens T. Mason	Democrat	1836–40
William Woodbridge	Whig	1840–41
James W. Gordon (acting)	"	1841–42
John S. Barry	Democrat	1842–46
Alpheus Felch	"	1846–47

STATE — *Continued*

John S. Barry	Democrat	1850–52
Robert McClelland	"	1852–53
Andrew Parsons (acting)	"	1853–55
Kinsley S. Bingham	Republican	1855–59
Moses Wisner	"	1859–61
Austin Blair	"	1861–65
Henry H. Crapo	"	1865–69
Henry P. Baldwin	"	1869–73
John J. Bagley	"	1873–77
Charles M. Croswell	"	1877–81
David H. Jerome	"	1881–83
Josiah W. Begole	Democrat and Greenback	1883–85
Russell A. Alger	Republican	1885–87
Cyrus G. Luce	"	1887–91
Edwin B. Winans	Democrat	1891–93
John T. Rich	Republican	1893–97
Hazen S. Pingree	"	1897–1901
Aaron T. Bliss	"	1901–05
Fred M. Warner	"	1905–11
Chase S. Osborn	"	1911–13
Woodbridge N. Ferris	Democrat	1913–17
A. E. Sleeper	Republican	1917–21
Alexander J. Groesbeck	"	1921–

Bibliography. *Michigan Geological Survey Report* (Lansing, 1839 et seq.); Lamman, *History of Michigan Civil and Topographical* (New York, 1839); Sheldon, *The Early History of Michigan* (ib., 1856); T. M. Cooley, *Michigan: A History of Governments* (Boston, 1885); Silas Farmer, *The History of Detroit and Michigan* (Detroit, 1889); Beal, *Michigan Flora* (Lansing, 1904); Webster Cook, *Michigan: Its History and Government* (New York, 1905); Dilla, *Politics of Michigan* (ib., 1912); Utley and McCutcheon, *Michigan as a Province, Territory, and State* (4 vols., ib., 1913); Lanzelere, *Government of Michigan* (ib., 1913); Skinner, *Story of Michigan* (Chicago, 1913); also the Thirteenth Census of the United States and publications of the United States Geological Survey.

MICHIGAN, Lake. The second largest fresh-water lake in the world (the largest being Lake Superior) and the only one of the American Great Lakes which lies wholly within the United States. It is bounded on the north by Michigan, on the east by Michigan and Indiana, on the south by Indiana and Illinois, and on the west by Illinois, Wisconsin, and Michigan (Map: United States, J 2). It lies between lat. 41° 37′ and 46° 5′ N. and long. 84° 45′ and 88° W.; is 320 miles long (north and south), with an average width of 65 miles; and has an area of 22,400 square miles. Its drainage basin includes 68,100 square miles. The lake's surface lies 581 feet above mean sea level, and its maximum depth is 858 feet. A true tidal variation of 3 inches has been recorded at Chicago.

Currents of from 4 to 10 miles a day set northward along the east short towards the lake's outlet at Mackinac Strait, and heavy north or south winds affect its normal level, raising or lowering it at either extremity—sometimes sufficiently to interfere seriously with navigation. There is also considerable seasonal fluctuation, the highest level from this cause being reached in February and the lowest in July or August. The lake is connected with the Mississippi River (which may have been its ancient outlet) by means of the Chicago Drainage Canal (q.v.). Green Bay (about 100 miles long) on the west shore and Grand Traverse Bay (about 30 miles long) on the east shore are the principal indentations, besides which there are minor ones, such as Big Bay de Noc and Little Bay de Noc, just north of the entrance to Green Bay. This scarcity of harbors and shallowness of the water near the shores make navigation dangerous during the not infrequent heavy winds. An elaborate system of lighthouses, lightships, foghorns, buoys, weather-report and storm-signal stations, established and maintained by the Federal government, lessens these perils. There are no islands except in the northern portion of the lake, where are Beaver Island (about 50 miles long), Washington Island (at the entrance to Green Bay), and North Manitou and South Manitou islands (west of Grand Traverse Bay). In the winter months the northern reaches of the lake are frozen over, but the solid ice stops well north of Milwaukee. Mackinac Strait is usually closed from about the end of the first week in January until about the middle of April.

Lake Michigan receives no large rivers; the most considerable streams which flow into it are the Menominee and the Fox (qq.v.), which empty into Green Bay, and the Manistee, Muskegon, and Kalamazoo (qq.v.), which are Michigan rivers. The lake has important fisheries, especially of lake trout and salmon, which are exported in large quantities, both fresh and canned. Along the north shore is some rugged highland country, with one peak which reaches an altitude of about 1400 feet above sea level, and much of the east shore is skirted by sand hills from 100 to 250 feet high. Elsewhere, and especially along or near the southern portion of the lake, is some of the most productive agricultural land in the United States; and these conditions make the lake an exceedingly important medium in a huge trade in all kinds of grains, fruits, live stock, lumber, etc., as well as various metals and minerals which are also found near by. Chicago and Milwaukee (qq.v.) are the principal cities on the lake. Consult: "Sailing Directions for Lake Michigan, Green Bay, and the Strait of Mackinac," United States Navy, Hydrographic Office, *Publication No. 108 B* (Washington, 1906); "Survey of Northern and Northwestern Lakes," United States Lake Survey Office, *Bulletin No. 117* (Detroit, 1907); *The Gulf and St. Lawrence River*, published by the United States Navy, Hydrographic Office (3d ed., Washington, 1908). See Great Lakes.

MICHIGAN, University of. A coeducational State institution at Ann Arbor, Mich., chartered in 1837. According to the terms of the charter, branches were established at various places to serve as preparatory schools of the university. These existed only a short time and were the forerunners of the State high schools, which are now in intimate relation with the university. The institution was opened in 1841, graduating its first class in 1845. It is intended primarily for the higher education of residents of the State, but receives students from all parts of the country on payment of a small tuition fee. The governing body is a board of regents, elected for terms of eight years. The university is organized in eight departments: College of Literature, Science, and the Arts; College of Engineering and Architecture (opened in 1853); Medical School (1850); Law School (1859); College of Pharmacy; the Homœopathic Medical School (1875); the College of Dental Surgery (1875); and the Graduate School (separated from the other departments in 1912). Each department has its special faculty, with representation in the University Senate, which considers questions of common interest. The degrees conferred are bachelor and master of arts, science, engineering, architecture, and law; civil, mechanical, electrical, chemical, and marine engineer; and doctor of philosophy, science, medi-

cine, public health, dental surgery, and dental science. The total attendance in 1913–14, including the Summer Session, was 6500, of whom 2614 were students in the College of Literature, Science, and the Arts, 1332 in engineering, 123 in architecture, 288 in medicine, 612 in law, 107 in pharmacy, 78 in homœopathic medicine, 286 in dentistry, and 298 in the Graduate School. The total attendance of women, exclusive of the Summer School, was 857. The university, up to 1914, had conferred degrees on 29,614 persons, of whom over 3500 were women. The university was a pioneer in coeducation, women having first been admitted in 1870. They now constitute about one-third of the College of Literature, Science, and the Arts and about one-sixth of the student body. Coeducation at the university has been uniformly successful. The libraries of the university, including a number of important collections, aggregate 350,000 volumes. The university museums contain collections illustrative of natural history, the industrial arts, chemistry, materia medica, anatomy, archæology, ethnology, the fine arts, and history, including a very full Chinese exhibit sent by the Chinese government to the New Orleans Exposition and presented to the university in 1885. The Detroit Astronomical Observatory contains a meridian circle, mounted clocks, a 13-inch refracting telescope, and a reflecting telescope with a mirror 37⅜ inches in diameter, together with a set of horizontal and vertical seismographs. A smaller observatory is used in the work of instruction. There are two hospitals connected with the university, and the State Psychopathic Hospital is located in Ann Arbor in charge of the university. The Waterman Gymnasium, for men, and the Barbour Gymnasium, for women, are free to all students, and physical training is required of all freshmen. The general supervision of athletic sports is vested in a board of control of 11 members, five chosen from the University Senate, three from the alumni, and three from the Students' Athletic Association. The university is a member of the Northern Oratorical League, which includes the universities of Chicago, Minnesota, and Wisconsin, the State University of Iowa, Northwestern, and Oberlin. It belongs to the Central Debating League, with the University of Chicago and Northwestern University. Entrance to the colleges of literature, science, and the arts, engineering and architecture, and pharmacy is based upon examination or upon certificates from accredited schools. Two years of collegiate work are required for admission to the medical and law schools, and one year for admission to the dental college. The university has two dormitories for women, but no commons. Among other developments the establishment of courses in forestry, in marine engineering, in highway and in conservation engineering, in aëronautics, in wireless telegraphy, and in public health is noteworthy. The faculty in 1914 numbered 553. The endowment of the university was $940,284, and its gross income for 1913–14 was $2,202,860. The total value of the college property was $5,844,601, of which the grounds and buildings were valued at $3,910,179. The president in 1915 was Harry B. Hutchins. Consult E. E. Slosson, *Great American Universities* (New York, 1910).

MICHIGAN CITY. A city in Laporte Co., Ind., 56 miles by rail east of Chicago, Ill., on Lake Michigan and on the Père Marquette, the Lake Erie and Western, the Chicago, Indianapolis, and Louisville, and the Michigan Central railroads (Map: Indiana, D 1). It is the seat of the Northern Indiana State Prison and has a public library, a United States life-saving station, a public park on the lake front, and a soldiers' monument. There are good transportation facilities, to which are due the city's large commercial interests, the trade being principally in lumber, salt, and iron ore. The manufactures of railroad cars, chairs, hosiery and knit goods, lumber and products of lumber are important. The government, as provided by the charter of 1837 and numerous amendments thereto, is vested in a mayor, who holds office for four years, and a common council, which elects all administrative officials, excepting the statutory municipal officers, who are chosen by popular vote. The city owns and operates the water works. Michigan City was laid out in 1832, settled in the following year, and incorporated in 1837. Pop., 1900, 14,850; 1910, 19,027; 1914 (U. S. est.), 20,710; 1920, 19,457.

MICHIGAN COLLEGE OF MINES. A mining school at Houghton, Mich., established in 1885. There are nine college buildings, with a library of about 27,000 volumes. In 1913–14 there were 26 instructors and 138 students. Its financial support is derived from the State.

MICHIGAN HERRING. The cisco (q.v.).

MICHIGAN STATE AGRICULTURAL COLLEGE. A coeducational State institution at East Lansing, Mich., the oldest institution of its kind in the country. It was established in pursuance of a constitutional provision in 1855 and was opened in 1857. Its endowment consists of a fund of $990,000 derived from the sale of part of the lands (235,673 acres) given by the general government through the Act of 1862. There are five courses—agricultural, engineering, forestry, veterinary science, and women's or home economics—which were attended in 1914–15 by 1907 students under a faculty of 130. The library contained 33,000 volumes. Farmers' institutes are carried on annually in each county of the State, the total attendance at these schools in 1913–14 being about 214,000. The income from the endowment fund, with other government grants and State appropriations, amounted in 1914 to $358,000. In that year the buildings and grounds were valued at $585,600. The president in 1915 was J. L. Snyder, LL.D., Ph.D.

MICHMASH, mĭk'măsh. The site of the camp of the Philistines in the war at the beginning of Saul's reign, connected with the notable exploit of Jonathan (q.v.) related in 1 Sam. xiv. It was a town of Benjamin, about 7 miles north of Jerusalem. Its importance arose from its position on one of the two main roads from Jerusalem northward, at a point where the road descends into a steep and rugged valley. Josephus (*Ant.*, vi, 6, 2) gives a detailed account of Jonathan's exploit, which tallies well with the features of the locality to-day. Men of Michmash returned with Zerubbabel (Ezra ii. 27; Neh. vii. 31). It is mentioned in the forecast of an Assyrian invasion in Isa. x. 28 et seq. In the time of the Hasmonæans it became the headquarters of Jonathan (1 Macc. ix. 73) and was a large village in the time of Eusebius. It is the modern Makhmas, a village of 400 inhabitants. Near it the Wadi el Suweinit narrows into a ravine answering to the description of the passage of Michmash in 1 Sam. xiv. 4, 5, and the two "sharp rocks" have also been

identified. Consult Benzinger, in Baedeker's *Palestine and Syria* (5th ed., Leipzig, 1912).

MICHOACÁN, mē-chō'ä-kän'. A Pacific coast state of Mexico, bounded by the states of Jalisco, Guanajuato, and Querétaro on the north, Mexico on the east, Guerrero and the Pacific Ocean on the south, and Colima and Jalisco on the west (Map: Mexico, H 8). Area, 22,617 square miles. The surface is generally mountainous, although its highest elevations are below 13,000 feet. It is divided by the Sierra Madre Occidental into a northern region, which forms a part of the great central plateau, and a southern one, consisting of fertile valleys and wooded ranges, sloping gradually to the Balsas River and the Pacific Ocean. The northern region is rather flat and interspersed with numerous lakes, of which the largest are Chalapa, partly in the State of Jalisco, Cuitzeo, and Pátzcuaro. With the exception of the large rivers Lerma and Las Balsas, forming part of the boundaries, and the Tepalcatepec, a tributary of Las Balsas, crossing the state from east to west, the rivers are small. The climate is on the whole healthful, except in the southern part, where fever prevails to some extent. The soil is of remarkable fertility; the principal products are cereals in the more elevated parts and sugar cane, coffee, vanilla, tobacco, and other tropical plants in the valleys. An abundance of fine timber is found in the southern valleys and on the Pacific slope. The mining industry is important; the principal metals are gold, silver, copper, and iron. The Dos Estrellas mine, producing gold and silver, is the richest in the Republic. Stock raising is carried on to a considerable extent, and there is some manufacturing. The state lacks railway facilities, having only three short branches of the National railways, in the northern part. Pop., 1900, 935,808; 1910, 991,880. Capital, Morelia (q.v.). Michoacán was inhabited by the Taraseos, who had successfully resisted the domination of the Aztecs up to the time of the Conquest.

MICKIEWICZ, mĭts'kī-ä'vĭch, Adam (1798–1855). The greatest of Polish poets. He was born near Novogrodek, Lithuania; his father was a lawyer of the lesser nobility. Inclined to the study of nature, he took up mathematics and physics at the University of Vilna, which was at that time the centre of Polish national and intellectual life, but later passed to biology and literature (1815–19). After that he taught Latin and Polish at the Gymnasium in Kovno until 1823, publishing there the first collection of his poems in two volumes in 1822. To the legends, superstitions, and tales of the Polish nation contained in it Mickiewicz gave a wonderfully poetic form, and at one bound became the national poet of the Poles. The volumes contained two longer works, *Dziady* (Ancestors, Festival in Honor of the Dead), a romantic drama, and *Gražyna,* an historical epic. The former contains much autobiographical material. The poem is deficient in orderliness, the episodes being flung together with almost reckless freedom, but the chief theme—love—has, perhaps, never been better sung. *Gražyna* relates the noble death of a princess of that name, who dons the armor of her husband and thus disguised leads his army against the Teutonic Knights.

In 1824 Mickiewicz was arrested in Vilna on suspicion of revolutionary plotting and was sent to St. Petersburg. In the capital he formed a warm friendship with Pushkin, but soon went to Odessa (1825) as instructor in the Richelieu Lyceum. After nine months he visited the Crimea, and this was a turning point in his career. *The Crimean Sonnets* recording his impressions are glowing with Oriental color and graceful in form. In December, 1825, he obtained a position in the office of the Governor-General, Prince Golitzin, at Moscow. In 1828 he returned to St. Petersburg, and there published his second epic, *Conrad Wallenrod,* descriptive of the struggle of the Lithuanians against the Teutonic Knights. In 1829 the poet received permission to travel in Italy, Germany, and France. In Rome he became acquainted with Lamennais and Montalembert. In Weimar he met Goethe, who became greatly interested in him. After staying for a time in Rome, where he met James Fenimore Cooper, he started for Poland on hearing of the uprising of 1830, but, unable to cross the strictly guarded frontier, he went to Dresden, after lingering in Posen for a while, and soon settled in Paris. There he published in 1832 the famous *Books of the Polish Nation and Polish Pilgrimage* and the third part of his *Dziady.* In poverty and distress, he published in 1834 his masterpiece, *Sir Thaddeus* (*Pan Tadeusz*), a delightful portrayal of the life of Polish nobility at the beginning of the nineteenth century. In 1839 he was called to the chair of Latin literature at Lausanne and in the year following he was appointed the first incumbent of the newly founded chair of Slavic literatures at the Collège de France. But after a year or two, being influenced by one of his countrymen, Towianski, he began to intermingle his lectures with irrelevant discussions on politics, religion, and mysticism, and the French government was forced to stop his lectures in 1844. In 1848 he went to Italy and there undertook to form Polish regiments against Austria. Then, in 1849, he edited at Paris the *Tribune des Peuples,* which was soon stopped by the French government. In 1852 he was appointed a librarian in the Arsenal, and on the outbreak of the Crimean War Louis Napoleon sent him to Constantinople to organize Polish regiments against Russia. Here he died shortly afterward. He was buried in Paris; in 1890 his body was transferred to Cracow.

The best edition of Mickiewicz' works is that of 1838, in eight volumes, published in Paris, under the poet's personal supervision. The *Mélanges posthumes* were published in 1872–79 by his son Wladislaw, who also edited his father's *Correspondence* (1870–85). A critical edition of the poet's works was undertaken by the Mickiewicz Society (Lemberg, 1894 et seq.); the latest edition was prepared by Kallenbach (Cracow, 1911). They have been translated into most European languages. In French his *Chefs d'œuvre poétiques* appeared in 1882. His ballads and sonnets are to be found, in German, in Reclam's *Universal Bibliothek; Dziady* (Ahnenfeier), in German by Lipiner (Leipzig, 1887); *Gražyna,* in German by Nitschmann in *Iris* (ib., 1880); *Wallenrod,* by Weiss (Bremen, 1871); *Herr Thaddäus,* by Weiss (Leipzig, 1882) and Lipiner (ib., 1883). *Conrad Wallenrod* was translated into English by Leo Jablonski, and a poetical version of it by Cattley appeared in London in 1840. *Master Thaddeus* was rendered into English by Biggs (London, 1885). The best biography in French is by his son, Wladislaw Mickiewicz (Paris, 1888); revised and enlarged in Polish (Posen, 1890–94). In Polish there are, moreover, several biographies by

Chmielowski, Belcikowski, Kallenbach, and others; in Russian that of Pogodin (Moscow, 1912) is the latest. Consult M. M. Gardner, *Adam Mickiewicz, the National Poet of Poland* (New York, 1911).

MICKLE, mĭk''l, WILLIAM JULIUS (1735–88). A Scottish poet, born at Langholm, Dumfriesshire. Mickle failed as a brewer, settled in London as a writer, and became corrector to the Clarendon Press, Oxford (1765). In 1767 he published a narrative poem called *The Concubine*, reissued in 1778 as *Sir Martyn*. Excepting Thomson's *Castle of Indolence*, it is the best of the eighteenth-century imitations of Spenser's *Faerie Queene*. Retiring to a farm near Oxford, Mickle made a free version of the *Lusiad* of Camões (1775). To Evans's *Old Ballads* (1777–84) he contributed the fine ballad *Cumnor Hall*, which suggested Scott's *Kenilworth*. He may also have written the exquisite Scotch song *There's nae Luck about the Hoose* (ascribed also to Jean Adams). In 1779 Mickle went to Lisbon as secretary in the *Romney* man-of-war. He was most hospitably received and made a member of the Royal Academy of Portugal. He died at Forest Hill, not far from Oxford. Consult his *Poetical Works*, with biography, edited by Sim (London, 1807).

MIC'MAC. An important Algonquian tribe of Canada, occupying all of Nova Scotia, Cape Breton Island, and Prince Edward Island, with large portions of New Brunswick, Quebec, and Newfoundland. The name is of uncertain etymology. In all the colonial wars the Micmac sided with the French, those of southern Nova Scotia especially making a reputation by their inroads upon the New England settlements. They are now all civilized, fairly industrious as hunters, fishers, guides, and basket and curio makers, but without any appreciable desire to advance their condition; moral, sober, and law-abiding, and almost solidly Roman Catholic through the effort of early French missionaries and their successors. Their language and traditions have been investigated by the missionary Rand. Consult S. T. Rand, *Legends of the Micmacs* (New York, 1894).

MI'CON (Lat., from Gk. *Μίκων, Mikōn*). An Athenian painter and sculptor who flourished about the middle of the fifth century B.C., closely associated with Polygnotus (q.v.). He painted three of the walls of the Theseum, or Temple of Theseus, built by Cimon (not to be identified with the so-called temple of Theseus, still standing at Athens), and is said to have had a hand in the great picture of the battle of Marathon in the Stoa Poikile. He helped to decorate also the Anaceum, or Temple of the Dioscuri (Castor and Pollux), at Athens. (Consult E. A. Gardner, *Ancient Athens*, London, 1902, and C. H. Weller, *Athens and its Monuments*, New York, 1913.) He was especially skillful in the painting of horses.

MI'CROBE. A microscopic organism; especially applied to a bacterium. Various infectious diseases are caused by its presence. See BACTERIA.

MICROCEPH'ALUS. A condition in which the head is disproportionately small. The child is born with the skull completely ossified, or ossification takes place soon after birth. Normally the bones are separated by ununited sutures and by spaces called fontanelles, thus giving opportunity for expansion and growth of the brain. Microcephalics are generally deficient mentally, and may be abnormal in other ways. The bones of the cranium may be artificially separated by a surgical operation known as linear craniotomy, which in a measure restores the natural spaces between the bones. See MONSTROSITY.

MICROCHIROPTERA BAT. See CHIROPTERA.

MI'CROCLINE (from Gk. *μικρός, mikros*, small + *κλίνειν, klinein*, to incline). A potassium-aluminium (see POTASSIUM) silicate that crystallizes in the triclinic system and is near orthoclase in its properties, being a member of the triclinic group of feldspars (see FELDSPAR). It has a vitreous lustre and is white to cream yellow in color, and sometimes red or green. The green varieties are known as Amazon stone and are occasionally cut for semiprecious stones. The ordinary microcline, which is found both as crystals and in masses in granitic rocks, is of common occurrence; excellent specimens are found at Magnet Cove, Ark.

MI'CROCOC'CI. See BACTERIA.

MI'CROCON'ODON (Neo-Lat., from Gk. *μικρός, mikros*, small + *κῶνος, kōnos*, cone + *ὀδούς, odous*, tooth). A small fossil jaw of uncertain affinities found in the Triassic rocks. It has been considered by some American authors to belong to a group of vertebrates intermediate in position between the highest anomodont reptiles, the Theromorpha, and the lowest polyprotodont mammals. Consult Osborn, "On the Structure and Classification of the Mesozoic Mammalia," in *Journal of the Philadelphia Academy of Natural Sciences* (Philadelphia, 1888).

MI'CROCOSM (Lat. *microcosmus*, Gk. *μικρόκοσμος, mikrokosmos*, little world, from *μικρός, mikros*, small + *κόσμος, kosmos*, world) and **MAC'ROCOSM** (from Gk. *μακρός, makros*, great + *κόσμος, kosmos*, world). The belief, current in ancient times, that the world or cosmos was animated, or had a soul, led to the notion that the parts and members of organic beings must have their counterparts in the members of the cosmos. The natural philosophers of the sixteenth century took up this notion anew in a somewhat modified shape, and considered the world as a human organism on the large scale and man as a world, or cosmos, in miniature; hence they called man a microcosm and the universe itself the macrocosm. With this was associated the belief that the vital movements of the microcosm exactly corresponded to those of the macrocosm, and this led to the further assumption that the movements of the stars exercised an influence on the temperament and fortunes of men.

MI'CROCOS'MIC SALT, or SALT OF PHOSPHORUS. An ammonium-sodium-hydrogen phosphate, $NH_4NaHPO_4.4H_2O$, that crystallizes in the monoclinic system and is found native as the mineral *stercorite*. It was known to the older chemists, who extracted it from human urine. It may be made by dissolving crystallized sodium phosphate and ammonium chloride in water, heating the solution to boiling, then filtering and cooling to crystallization. On heating, the crystals melt readily, giving up water of crystallization, and later ammonia, and leaving sodium phosphate, which melts and solidifies on cooling to a clear colorless glass. It is used chiefly as a flux in blowpipe analysis.

MI'CROCY'CAS. A genus of cycads, one of the great groups of Gymnosperms, which is rep-

resented by a single species restricted to western Cuba.

MI'CRODIS'CUS (Neo-Lat., from Gk. μικρός, *mikros*, small + δίσκος, *diskos*, disk). A small Cambrian trilobite with body of oval outline, head and tail shields alike, and only three or four thoracic segments. Another name for the fossil is Goniodiscus. See AGNOSTUS; CAMBRIAN SYSTEM.

MI'CROFAR'AD. See FARAD.

MIC'ROLES'TES (Neo-Lat., from Gk. μικρός, *mikros*, small + λῃστής, *lēstēs*, robber). A small fossil jaw with multituberculate teeth found in the Triassic rocks of Württemberg and England. This fossil has figured prominently in discussions on the origin of the mammalia, and it is usually placed among the prototherian mammals; but, as the skull to which it belongs is entirely unknown, its exact systematic position is undeterminable, and it may prove to be the jaw of an anomodont reptile (Theromorpha) instead of that of a mammal.

MICROM'ETER (from Gk. μικρός, *mikros*, small + μέτρον, *metron*, measure). Any device by means of which it is possible to make a linear measurement more accurately by employing levers, screws, or magnifying glasses than by using a simple rule or scale. Figure 1 shows a simple form of lever micrometer adapted to the measurement of thicknesses, diameters, and the like. The movable lever *AB* turns on a pivot at *C*, and since the arm *CB* is five times as long as the arm *CA*, the pointer at the end of *B* will move over the scale *D* five times as far as the points are opened at *A*, and consequently the measurement is about five times as accurate as if a scale were applied directly. Figure 2 illustrates a form of simple screw micrometer. The screw has 10 threads to the inch, and consequently one complete revolution will remove the point of the screw *A* from the plate *C* one-tenth of an inch. The head *B* of the screw has its rim divided into 100 equal parts; hence a rotation of the screw through one of these parts means one one-hundredth of a complete revolution, and such a motion would remove the point from the plate by a distance of $\frac{1}{100}$ of $\frac{1}{10}$, or $\frac{1}{1000}$ inch. A very common form of screw micrometer, described and illustrated under CALIPERS, has 40 threads to the inch, and the head is divided into 25 parts, making the value of a scale division $\frac{1}{25}$ of $\frac{1}{40}$, or again $\frac{1}{1000}$ of an inch.

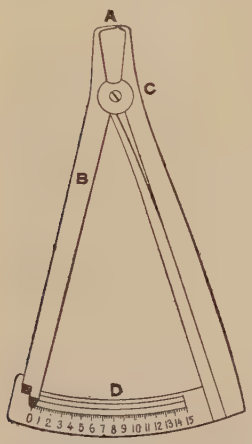


FIG. 1. LEVER MICROMETER.

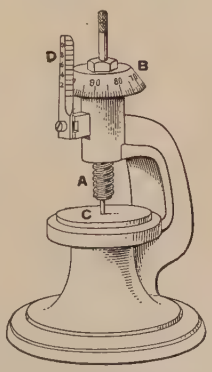


FIG. 2. SIMPLE BENCH MICROMETER.

In working with the telescope and the microscope it becomes necessary to make measurements upon the image formed by the objective, and for this purpose a micrometer ocular is employed. The simplest form of this device is a fine scale ruled upon glass in hundredths of an inch, or tenths of a millimeter, and so mounted in the draw tube that it will be seen distinctly by means of the eyepiece, and hence will be in the plane of the image formed by the objective. The scale appears to lie upon the object, and it is only necessary to read off the dimensions. A revolution of the draw tube makes measurements in different directions possible without moving the objective.

A more accurate and satisfactory micrometer ocular is that devised by Ramsden and illustrated in Fig. 3. *H* is the divided head of a micrometer screw *S* reading to a hundredth of a screw revolution, $\frac{1}{200}$ millimeter, e.g., where the pitch of the screw is a half millimeter. The screw is so arranged that it will cause a rectangular frame *AA* to move backward and forward as the screw revolves. Across the middle of the frame *AA* are stretched two fine spider lines, at right angles to the axis of the screw and quite close together. The whole device is so attached to the draw tube of the microscope or telescope that the spider lines lie in the focal plane of the objective and hence are distinctly seen magnified by the ocular. In making measurements with this instrument the screw *S* is turned until the spider lines straddle one point, and then a reading is made of the position of the head *H*. Next the screw is again turned until the lines straddle the other point, another reading is made, and the difference of the two readings gives the distance between the points upon the image. By placing a known scale, e.g., a tenth of a millimeter, upon the stage of the microscope, and measuring the image as above, the magnifying power of the microscope objective is obtained, and it is possible to calculate what distance upon the stage or in the object corresponds to one revolution of the micrometer screw. The whole number of revolutions of the screw is sometimes read by means of a second wheel so geared to *H* that it makes one revolution for 20 or 30 revolutions of the screw *S*. In other cases a strip of metal with small teeth like saw teeth, and as far apart as the threads of the screw *S*, is placed across

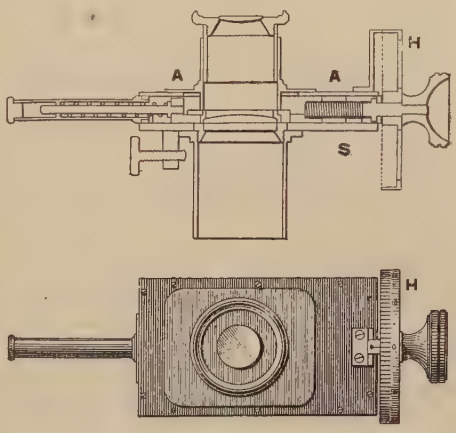


FIG. 3. MICROMETER OCULAR.

the side of the opening so that the double spider line appears to move over it from tooth to tooth, each tooth corresponding to one complete revolution of the screw. Such micrometers are used in measuring objects under the microscope, in most accurate linear and angular determinations, and in telescopes for obtaining star distances, and for a great variety of measurements. A very elaborate and delicate micrometer attached to the eye end of the telescope and used in star work is called a position micrometer. A special form of micrometer is used for measuring the star distances on the photographic plates that are taken of star groups and clusters. See MICROSCOPE; TELESCOPE.

MICROMETER CALIPERS. See CALIPERS; MICROMETER.

MI'CRONE'SIA (Neo-Lat., from Gk. *μικρός, mikros*, small + *νῆσος, nēsos*, island). A name of Greek origin, meaning "small islands." It is used to designate that part of Oceanica which consists of the Ladrone and Caroline islands, Marshall Islands, the Gilbert group, and many others of small size. All of these lie northwest of Polynesia, north of Melanesia, and east of the Philippines, between long. 130° and 180° E. The group also forms an ethnological division of Oceanica. (See MICRONESIANS.) Politically they were apportioned to Great Britain, the United States, and Germany, but in the War of 1914 Germany's islands were seized by the allies.

MI'CRONE'SIANS. The inhabitants of Micronesia (q.v.). They belong undoubtedly to the Malayo-Polynesian race, although the authorities differ concerning their ethnic purity. Finsch, who had personal knowledge of most Oceanian tribes, unites Micronesians and Polynesians under a single head, attaching to their separation a purely geographical, not anthropological, meaning. The languages of Micronesia are Melanesian. The mass differ in type slightly from the Polynesians; they are more hairy, are shorter, and their heads are more elongated. Culturally the Micronesians have developed considerable individuality. Adzes are usually of shell, even where excellent stone material is available. Matting and plaitwork are highly developed, and the Caroline Islanders even weave on a loom. Bark cloth, while not lacking, is far less common than in Polynesia. Shells are very largely used as currency. The Marshall Islanders are skilled mariners and in former times they constructed stick charts to guide their navigations. For part of the Micronesians (e.g., those of Ponape and the Marshall group) an exogamous clan system with maternal descent has been established, and the kinship terminology is of the classificatory type and of the form originally called "Malayan" and now "Hawaiian." In the Gilbert Islands the warlike natives used very dangerous spears and daggers set with sharks' teeth and wore a protective armor of coconut-fibre cuirasses, jacket, and trousers.

Bibliography. Meinicke, *Die Inseln des Stillen Ozeans* (Leipzig, 1875); Heinsheim, *Beitrag zur Sprache der Marshall-Inseln* (ib., 1880); id., *Südsee Erinnerungen* (Berlin, 1883); Bartolis, *Las Carolinas* (Barcelona, 1885); Kubary, *Ethnographische Beiträge zur Kenntnis des Karolinen-Archipels* (Leyden, 1889–95); Finsch, *Ethnologische Erfahrungen und Belegstücke aus der Südsee* (Vienna, 1893); Cabeza Pereira, *Estudios sobre las Carolinas* (Manila, 1895); Bastian, *Die mikronesischen Colonien aus ethnologischen Standpunkten* (Berlin, 1899); Christian, *The Caroline Islands* (London, 1899); id., "On Micronesian Weapons," in the *Journal of the Anthropological Institute* (ib., 1899); Krämer, *Hawaii, Ostmikronesien, Samoa* (Stuttgart, 1906); Erdland, *Die Marshall-Insulaner* (Münster, 1914). See POLYNESIANS.

MI'CROÖR'GANISM. See BACTERIA.

MI'CROPHONE. See TELEPHONE.

MI'CROPHOTOG'RAPHY, or PHOTOMICROGRAPHY. The art of photographing minute objects, generally microscopic preparations of bacteria or tissue, for the purpose of making illustrations or projections upon the screen. The apparatus consists of a large-barreled compound microscope and a suitable camera having a long bellows which fits over the eyepiece of the microscope to exclude all light except that illuminating the object to be photographed. Both microscope and camera are fixed upon an immovable base, free from vibration. Sunlight or artificial light may be utilized, the latter being derived either from a paraffin lamp, incandescent gas, oxyhydrogen, acetylene, or electric light. There is also provided by certain microscope makers an elaborate illuminating system of condensers and lights such as is used in a projection apparatus. When dealing with fields under a low power of magnification and using a paraffin lamp the substage condenser may be dispensed with; under high powers of magnification a substage achromatic condenser is required. The whole field must be evenly illuminated and the flame image eliminated. This is done in various ways: with the paraffin lamp, e.g., the flame image is focused accurately in the centre of the field and the light rays are then broken up by interposing a bull's-eye condenser. When using the oxyhydrogen light the lantern is removed far enough away to secure the requisite diffusion. Depending on the intensity of illumination and the character of the object, exposures vary from $\frac{1}{25}$ of a second to 10 minutes. The degree of amplification varies with the object and with the distance of the focusing screen from it. The amplification afforded at a given distance is determined by photographing, under exactly similar conditions, the lines of the micrometer slide. The manipulation of plates and holders and the developing methods are the same as in ordinary photography (q.v.). See also MICROSCOPE; MICROSCOPY.

MI'CROPYLE (from Gk. *μικρός, mikros*, small + *πύλη, pylē*, gate), IN PLANTS. The ovule of seed plants differs from the megasporangium of Pteridophytes in developing an integument of one or two layers. The body of the ovule (the real sporangium), covered by the integument, has been called the nucellus. In most cases the integument is not complete around the nucellus, but is open at its tip, and this passageway through the integument is called the micropyle. Through this micropyle the pollen tube usually reaches the nucellus. In some cases the integument is complete around the nucellus, and leaves no micropyle; also in quite a number of plants the pollen tube does not enter the ovule by way of the micropyle. (See CHALAZOGAMY.) When the structures connected with the ovule have developed into a seed the position of the micropyle is represented by a scar; and in the germination of the seed the tip (hypocotyl) of the embryo usually emerges through the seed coat at the micropyle. See OVULE.

MICRORADIOMETER. See RADIOMETER.

MI'CROSCOPE (from Gk. *μικρός, mikros,* small + *σκοπεῖν, skopein,* to view). An instrument by which objects are made to appear of greater magnitude. Undoubtedly the oldest miscroscope on record is a plano-convex lens of quartz found by A. H. Layard amid the ruins of Nineveh, surrounded by articles of bronze and other materials. It is now in the British Museum, and is 0.5 cm. (less than 0.2 inch) in thickness, 3.5 cm. (1.4 inches) in diameter, and its focal length is 10.7 cm. (about 4 inches). Many authorities believe with good reason that this lens was used as a burning glass, as similar ones were used for that purpose at the time of Socrates. On the other hand, there can be no doubt that such lenses were used as simple microscopes, or magnifying glasses, inasmuch as the apparent increase of size of an object seen through them must inevitably have attracted the attention of such good observers, and moreover the elaborate and delicate engraving on many of the seals and gems of that period furnishes sufficient evidence that some means must have been employed to aid the eye in executing this work. Spherical glass vessels filled with water would also have called attention to their employment as magnifiers; spherical drops of glass would act similarly.

During the later Middle Ages such simple lenses came more and more into use, especially as aids to the eye in ordinary vision, as spectacles. A spectacles maker of Middelburg, Holland, Zacharias Janssen, undoubtedly was the first to build a compound microscope, and about 1590 constructed such an instrument and presented it to Charles Albert, Archduke of Austria. It was nearly 6 feet long, supported upon brass dolphins on an ebony board. It contained only two lenses. Robert Hooke (1635–1703), secretary of the Royal Society, made many improvements in the construction and use of the microscope, and Divini in 1668 improved the instrument by using two plano-convex lenses as an eyepiece. (See below.) In 1686 Campani improved the form of the instrument and introduced the use of a screw for proper focusing. Nevertheless the development of the microscope took a different direction, on account of the serious difficulties with aberration (q.v.) in short-focus lenses, and under the influence of Leeuwenhoek attention was returned to the development of the simple microscope. Antony von Leeuwenhoek (1632–1723) constructed very efficient and convenient simple microscopes, developing the method already tried by Hooke and Hartsoeker of making high-power lenses by allowing a drop of molten glass to occupy a small hole in a plate of brass. Even a drop of water or oil was also used in this way. Leeuwenhoek is said to have made 247 microscopes, observing the circulation of the blood in the feet of frogs, spermatozoa, and many other interesting things. To this period belong also the names of Wilson (1708–88), Hartsoeker (1656–1724), Stephen Gray (?–1736), Jan van Musschenbroek (1687–1748), Leutmann (1667–1736), and others.

About this time Samuel Reyher (1635–1714) employed such a lens to project an image upon the wall or a screen, using the sunlight for illumination, and is thus probably the inventor of the solar microscope. Baker (1698–1774), with the aid of the mechanic Scarlett, constructed in 1736 a catoptric microscope, using mirrors instead of lenses in a manner suggested by the Gregorian telescope. But such instruments never came to be of much importance, since Dolland (1706–61) in 1757 confirmed the theoretical conclusions of Euler (1707–83) and Klingenstierna (1698–1765) that for the same refraction the dispersion might be different, and thereupon proceeded to construct an achromatic objective, i.e., a lens in which the color effects are eliminated by the use of two kinds of glass. Nevertheless the great difficulty of grinding such small lenses with sufficient accuracy for the correction of the errors due to aberration prevented their use in a manner at all commensurate with their successful employment in astronomical telescopes.

In 1823 Selligues and Chevalier departed from the plan of using only two lenses to correct aberration and employed two or three pairs of lenses (see Fig. 6), each pair consisting of a plano-concave of flint glass, which dispersed the colors far apart, combined with a double convex of crown glass, which has a low dispersion. In this way excellent achromatic objectives were produced. In the next year Tulley of London, upon the suggestion of Dr. Goring, constructed an achromatic combination of three lenses, without knowing of the work of Selligues and Chevalier. Amici of Modena had been endeavoring to produce achromatic microscope objectives as early as 1812, and, encouraged by the success of Selligues and Chevalier, he took up the work with new energy and produced in 1827 a combination much superior to any known at that time. His work was soon rivaled by that of Andrew Ross and Powell in London. J. J. Lister, as a result of his theoretical investigations, directed James Smith in the construction of an objective that surpassed all others in the perfection of its correction, angular aperture, and flatness of field.

With these lenses A. Ross soon discovered that the presence or absence of a cover glass over the object affects the success of the correction. In other words, he discovered that the cover glass must be considered as a part of the objective system. He pointed out that its effect may be counteracted by undercorrecting the first pair of lenses in the objective and overcorrecting the other two pairs; moreover, if the distance between the first and second pairs of lenses of the objective can be varied, this makes it possible to adapt the correction of the objective to various thicknesses in the cover glass and to various kinds of cover glasses.

For a long time the best microscope objectives of high power were composed of three pairs of achromatic lenses, but Amici himself tried a single plano-convex lens next to the object and recently this has become quite popular. (See Fig. 7.) Amici also pointed out that where very short-focus lenses are used a drop of water may be introduced between the cover glass and the first face of the objective, thereby reducing the loss of light. It is, however, evident that this would affect the refraction and dispersion of the system and hence throw out the correction. Apparently Amici was never able to adapt his systems to this method of use, and it remained for Hartnack and Nachet to succeed in constructing objectives for such use and to point out their great superiority in many ways over the older form, which came to be called "dry" objectives, in distinction from this new form, which were called "immersion" objectives. The immersion system has very great advantages

over the dry on account of the gain in light by avoiding the strong reflection from the front lens in air, also because the correction of the cover glass is greatly simplified, and besides the range, or working distance, is considerably increased. Naturally a lens constructed for immersion cannot be used satisfactorily for dry work, but Powell and Lealand so arranged their objectives that by exchanging the front lens it could be changed from dry to immersion or vice versa. Wenham still further improved upon this by so constructing the system that the objective could be changed from one form to the other by simply changing the distance between the first and second elements of the system, this being accomplished by turning a screw, as in correcting for cover glasses in dry systems. See Fig. 6.

Wenham also seems to have been the first to suggest the advantage of substituting for water a liquid which should have the same dispersion and refraction as the cover glass and first lens of the objective, and it is to the zeal and energy of Zeiss of Jena, under the able guidance of Dr. Abbé, that are due the almost perfect objectives which are available at the present day. The complex form shown in Fig. 7 is due to Abbé and is known as an "apochromat"; its corrections are so perfect that it appears that the theoretically ideal conditions have been reached. Bausch and Lomb in America and Carl Zeiss in Germany are now constructing lenses under the specifications of Dr. Abbé. It should be stated in this connection that the present great success in the construction of lenses of all sorts is in large measure due to the manufacture by Schott of Jena of glass upon scientific principles, so that it is not only possible to get glass with the same optical properties in large quantities and at any time, but it has been possible to make glass with just those optical properties which are wanted for any particular purpose. Objectives designed to be used as immersion lenses, with a liquid of refraction and dispersion identical with that of the glass in contact with the liquid, are called "homogeneous" immersion lenses. Oil of cedar and oil of fennel are well adapted to use with such objectives.

Simple Microscope. A simple lens, or a combination of two or more lenses nearer together than the sum of their focal lengths, and acting as a single lens, so used as to supplement the optical system of the eye and increase the apparent size of an object, is properly called a simple microscope, or magnifying glass. The observer judges of the size of an object by the

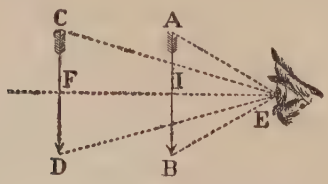


Fig. 1.

visual angle which it subtends. For example, *AB*, Fig. 1, appears larger than *CD* because the visual angle *AEB* is greater than the visual angle *CED*. Any device which increases the visual angle which an object subtends makes it appear larger. It is impracticable to bring the object indefinitely near to the eye and thus enlarge the visual angle, because the accommodation of the normal eye does not enable it so to adjust its optical system as to see distinctly an object much less than 20 to 25 cm. (8 or 10 inches) distant. In other words, the normal eye can bring to a sharp focus on the retina only such rays of light as are parallel or slightly divergent. If a convex lens is placed close in front of the eye and an object in front of it, and distant a little less than its focal length, as shown in Fig. 2, the lens will form a virtual

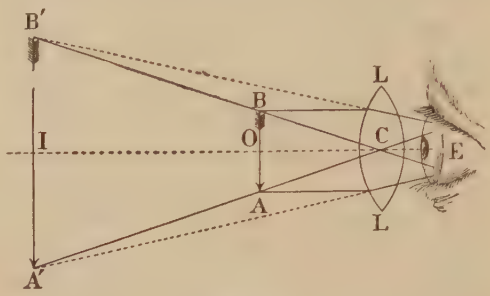


Fig. 2.

image *I* of the object *O* at *A′B′*, and the light issuing from *LL* is of such divergence as to be readily brought to a focus upon the retina by the lenses of the eye, and hence vision is distinct and the visual angle and apparent size of the object are increased. From a consideration of Fig. 1 it is evident that practically the apparent increase in size is approximately proportional to the decrease in distance between the object and the eye. Under the normal conditions that the distance *IE*, Fig. 1, is at least 20 to 25 cm. (8 to 10 inches), and we can see distinctly only a comparatively small area at once, the angle *AEB* is small and approximately proportional to the ratio of *AB* to *IE*, hence $AEB \div CED = FE \div IE$, and the visual angle is inversely proportional to the distance from the eye to the object. Applying this to Fig. 2 gives $A'B' \div AB = IC \div OC$, inasmuch as *C* is very close to the eye. *IC* is the distance of distinct vision and *OC* is practically the focal

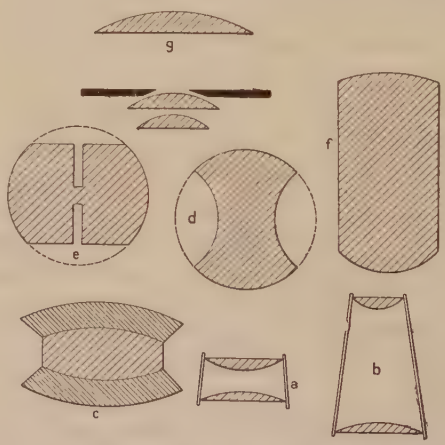


Fig. 3. LENSES FOR SIMPLE MICROSCOPE.

length of the lens *C*. It is hence evident that the magnifying power of a simple lens is equal to the ratio of its focal length to the distance of distinct vision. For example, a lens of a

focal length of 1 cm. (⅜ inch) would magnify 25 cm. ÷ 1 cm., or 25 diameters. Magnifying powers are always given in diameters, i.e., in the magnifying of any linear dimension and not of the area of the object.

Simple lenses of very short focus are not well adapted to obtaining very high magnifying power, on account of their chromatic and spherical aberrations, which render the image so colored and indistinct that accurate work is impracticable. A form of stand for simple microscope especially convenient for biological work is shown on the accompanying plate (Fig. 1). *A* is the lens or lens combination, *B* is the table for holding the object, and *D* is the mirror for concentrating light upon the latter; *C* is the rack and pinion enabling a convenient adjustment of the focus. Such instruments are useful for dissecting small organisms, and can be furnished with magnifying power up to 100 diameters. Fig. 3, above, shows several methods of obtaining strong combinations with less aberration and without the cost of elaborate correction. Fraunhofer designed the doublet *a*; *b* is a form used by Wilson; *c* is a so-called aplanatic triplet by Steinheil; *e* is the original Coddington, modified to the form *d* by Brewster, and *f* is the common cylindrical lens that obtains good results on account of the slight curvature of the face nearest the object; *g* is the original Holland triplet in which the diaphragm cuts off the stray light and improves the correction greatly, a result attained in *e* and *d* by the side cuts in towards the axis. Wollaston pointed out that the improvement in using the two lenses is in the fact that the aberration of one is in large measure corrected by the other, the diaphragm serving to cut off that portion of stray light which would interfere with the distinctness of the image. The field of vision is also larger and more nearly flat than when a single lens is used.

Compound Microscope. In its simplest form as invented by Janssen the compound microscope consists of two lenses as shown in Fig. 4. The so-called objective lens *cd* forms a greatly enlarged image of the object *ab* at *a′b′*. The eyepiece *lm* is a simple microscope, or magnifying glass, and the eye of the observer is at *e*. The magnifying power of such a combination is obtained as follows: the image *a′b′* is larger than the object in the proportion of *b′c* to *ca*, and the eyepiece *lm* magnifies the image *a′b′* in the proportion of its focal length to the distance of distinct vision, 25 cm. In a particular case, suppose *ca* is 0.2 cm., *cb′* is 20 cm., and the focal length of *lm* is 2 cm. Then the image *a′b′* will be larger than the object in the proportion of 20 to 0.2, i.e., 100, and the eyepiece *lm* will magnify the image in the ratio of 25 cm. to 2 cm., i.e., 12.5, and the total apparent increase in size will be 100 × 12.5, or 1250 diameters. The Huygens eyepiece, so called from its inventor, is also called a negative eyepiece, because the two lenses are too far apart to make its use possible in the same manner as other forms. The action of this eyepiece is shown in Fig. 5 and also on the accompanying plate. The objective would form an image at *aa* if it were not that the lens *ff* of the eyepiece is introduced, and consequently the combined effect is to form the image really at *bb;* this is then viewed by the eye lens *ee*. A diaphragm is interposed at *bb* to cut off stray light and improve the distinctness. *ff* is called the field lens of the eyepiece and *ee* is the eye lens. The great advantage of this form of eyepiece lies in the fact that the chromatic and spherical aberration of the field lens *ff* is opposite and about equal to that of the eye lens *ee*. Although this lens is very satisfactory for general microscopic work it is practically little used where it is necessary to use a micrometer (q.v.) in the eyepiece, or a cross hair.

Naturally the most important optical part of the microscope is the objective, as upon its perfection depend the satisfactory results of the whole combination. In its simplest form it is only a plano-convex lens with its flat side towards the object. As usually seen it is as

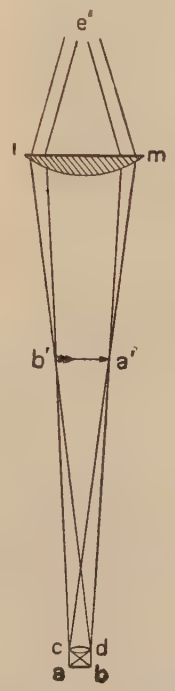


FIG. 4. SIMPLE COMPOUND.

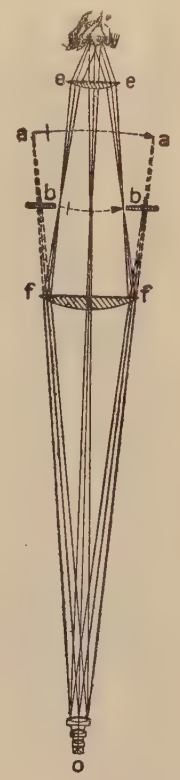


FIG. 5. COMPOUND MICROSCOPE WITH HUYGENS EYEPIECE.

shown in Fig. 6, with two or more achromatic pairs; the Zeiss objective there shown also illustrates how the cover-glass correction is accomplished by varying the distance between the first two and the last two pairs of the objective, by means of a screw *E*. Figure 7 illustrates the lenses of one of Dr. Abbé's most perfect objectives, the "apochromat." In general the eyepiece must not be astigmatic, i.e., it must be able to form a sharp image of a point. It must be orthoscopic, i.e., it must magnify all parts of the image equally. It must be achromatic, i.e., it must not show any colors not really present in the object.

The above characteristics must also be possessed by the objective even more essentially and perfectly than the eyepiece. In addition it is necessary to understand what is meant by other peculiarities of the objective. Under "aperture" is meant the angle between the limit-

ing rays of the effective beam in the formation of the image by the objective, e.g., the angle *cad* or *cbd*, Fig. 4. This is naturally affected by the index of refraction of the medium between the object and the objective, and would hence be different with the same objective if it were used dry, as water immersion, or homogeneous immersion, and consequently it has been proposed to use the product of the sine of half this angle by the index of refraction as indicating the effective aperture irrespective of the method of using the objective, and this constant is called the numerical aperture. The resolving power of an objective must not be confused with the mag-

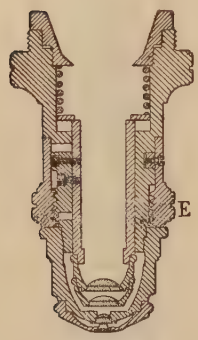


FIG. 6. SECTION OF ZEISS OBJECTIVE.

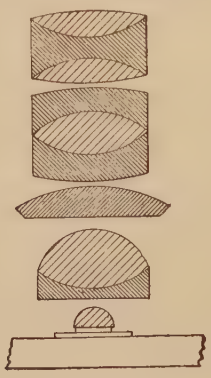


FIG. 7. "APOCHROMAT" OF ABBÉ.

nifying power, for theoretically any desired degree of magnification can be obtained, but there is a definite limit to the resolving power set by diffraction phenomena, as pointed out by Dr. Abbé. Owing to the fact that a lens on account of diffraction is not able to form an actual point, as the image of a point, it is evident that if the little rings which are formed overlap, then no degree of further magnification can separate them, and they will confuse the vision. It has been shown that the success of an objective in gathering in all the components due to diffraction is directly dependent upon the numerical aperture. Abbé has calculated that the theoretical limit of resolving power for an aperture of 180° would be lines about 120,000 to the inch, falling to about 95,000 for 107°. This has been nearly reached in some of the best instruments. Theoretically two lines must be distant from each other at least $\lambda/2a$, in order to be seen distinctly, where a is the numerical aperture and λ is the wave length of the light.

While Abbé succeeded in increasing the resolving power of the microscope by increasing its numerical aperture a (i.e., by decreasing the value of the fraction $\lambda/2a$), Koehler attacked the problem by decreasing the value of λ. As a source of light he employed the intense *cd* line of wave length 275 $\mu\mu$ lying in the ultra-violet. The entire optical system of the microscope was made of crystal quartz and the results were obtained by photography. Thus, by using light of wave length 275 $\mu\mu$, which is but one-half as great as that of visible green light (λ = 550 $\mu\mu$), and by using an immersion of glycerin and water (thus increasing the value of a), a great increase in the resolving power was attained. Photographs of diatoms obtained by this procedure showed a wealth of detail never before observed. Another advantage to be derived by this method is that different portions of a cell possess different transparency towards ultra-violet light and thus become visible in the final photograph.

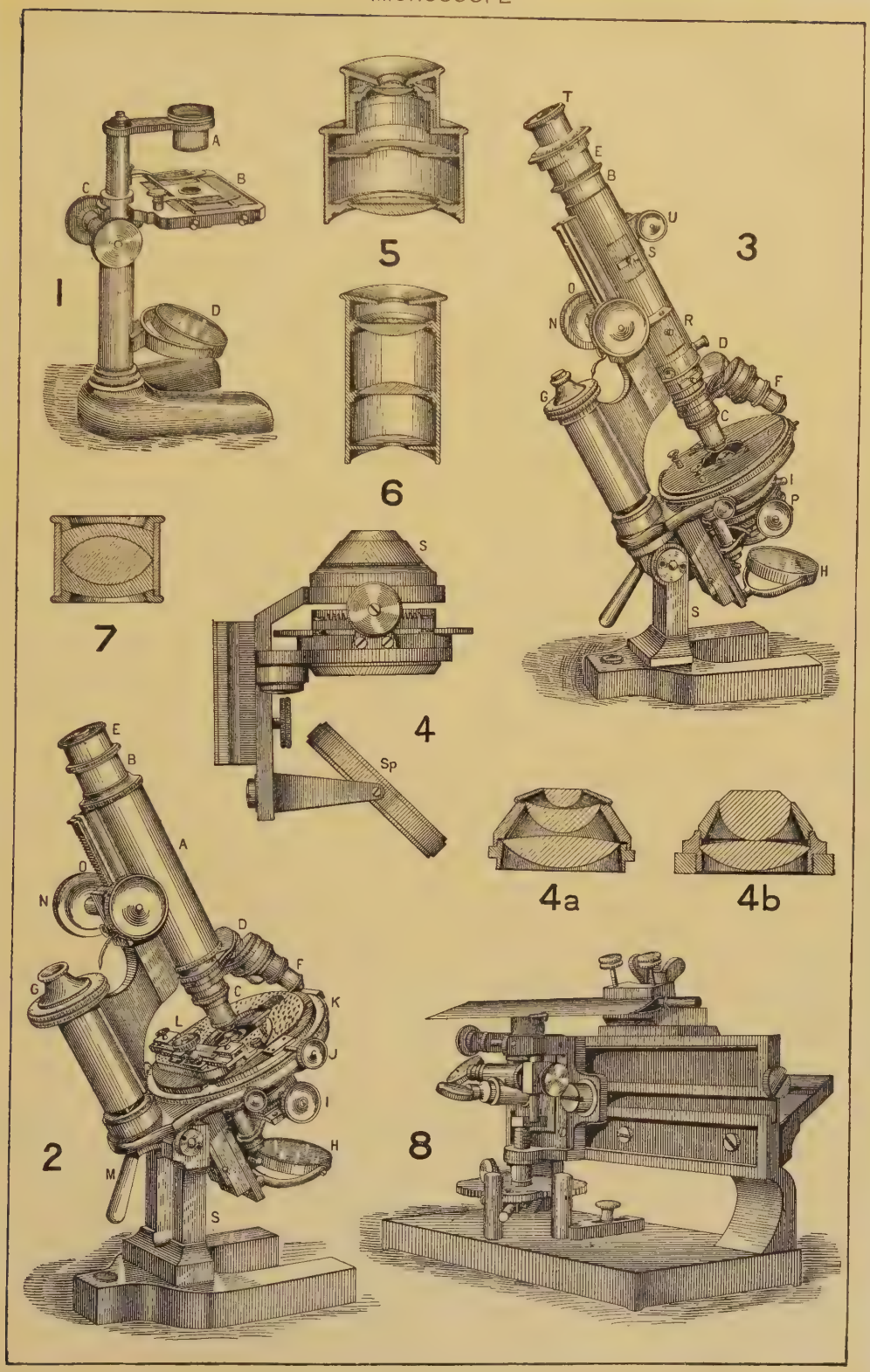
In order to make use of the highest efficiency of the objective it is necessary to devote much attention to the concentration of the light upon the object in order that the image may be well lighted and also that the full aperture of the objective may be utilized. A form of condenser which is placed under the object is shown in the accompanying plate (Fig. 4); *Sp* is the mirror for reflecting the light into the condenser *S*, and the rest is mechanism for suitable adjustments. The adjoining figures show the section of such a condensing lens.

On the accompanying plate (Fig. 2) is shown a modern microscope of a high order as fitted for general and biological work. The main stand *S* is so hinged that the top may be tilted at any angle and clamped by the lever *M*. The tube *A* carries at its lower end a triple nose piece *D*, enabling the observer rapidly and easily to exchange objectives *C*, *F*, etc. In the upper end of *A* is the draw tube *B*, enabling the observer to change the distance between his objective *C* and eyepiece *E*. *LCKJ* is the stage or table on which the objects are placed. *K* is a vernier reading the angular rotation of the stage. *L* and *J* are milled heads operating the mechanical stage, making it possible to move the object regularly up and down or right and left in searching for an object in the slide, in counting, and the like. *I* is the substage condenser and its mounting, including a diaphragm. *NO* is the rack and pinion for rough adjustment of the focus and *G* is the fine adjustment, making it easy to adjust accurately the focus of a high-power objective and in some cases to make measurements.

A similar instrument, as fitted for petrographic work where polarized light is used, is also illustrated on the plate. This particular microscope is not fitted with a mechanical stage. At *P* is introduced a polarizer Nicol prism for furnishing a beam of polarized light, and another Nicol prism used as the analyzer is slid into the side of the tube at *R* or for other combinations at *S*. *U* is a rack and pinion for the adjustment of the draw tube, *B*. For some purposes the analyzer is put on top of the eyepiece at *T*. Either the polarizer or the condenser may be turned out from under the stage when not wanted. Between the objective and the analyzer is a side slot, into which may be introduced the quartz wedge, mica plate, etc., which are used in the determination of the optical constants of the minerals under study. For use in such instruments the rock to be investigated is ground to a very thin section mounted upon a glass strip, like any microscope preparation. Under these circumstances most minerals are quite transparent and the student is enabled, not only to learn the size and form of the grains, but also to subject them to an investigation under polarized light and identify their optical properties and determine completely their nature. The petrographic microscope has revolutionized the study of rocks.

There is also the binocular microscope, in which two eyepieces are used in order to secure a stereoscopic effect. (See STEREOSCOPE.) In a binocular microscope there is the usual arrangement of the objective, but one or more prisms of special design are interposed so as to deflect

MICROSCOPE



1. SIMPLE MICROSCOPE on stand for biological work
2. HIGH-POWER COMPOUND MICROSCOPE
3. PETROGRAPHIC MICROSCOPE
4. ABBÉ SUB-STAGE CONDENSER: 4a and 4b, lenses in section
5. HUYGENIAN EYEPIECE
6. RAMSDEN EYEPIECE
7. STEINHEIL POSITIVE EYEPIECE
8. MICROTOME

some of the rays to a second eyepiece. It is unavoidable that a certain amount of light is cut off in passing through the prism, or that the path of the rays is increased so that where the highest powers are employed the binocular is not used.

There are used in connection with the microscope many forms of the "camera lucida" (q.v.), a device to enable the operator to make a drawing of the object under study by tracing over the virtual image which he seems to see on the paper, as the eye of the observer sees both the light which comes up from the object and that which comes from the paper and pencil below the microscope. In preparing slides for work in microbiology it is necessary that the material should be in very thin sections, and this is accomplished by embedding the whole object in paraffin and then shaving off thin sections with a microtome, one form of which is shown on the accompanying plate (Fig. 8). Afterward the paraffin is removed and the shaving mounted upon a glass slide. These preparations are usually hardened by chemicals, and are frequently dyed with special solutions, which may, e.g., color the nerves and not the other parts, thus bringing out the contrast and assisting the work. Under some circumstances the object is frozen by means of liquid carbonic acid gas and then shaved in sections. It should be evident that by a simple device a camera may be made to take the place of the eye in any of the above cases, and by that means photographs may be taken of the objects under investigation.

Perhaps the most important development in the field of microscopy in recent years is the ultramicroscope. This instrument is due to Siedentopf and Zsigmondy, who had at their disposal the facilities of the Zeiss optical works. The principle upon which this instrument operates is as follows: on the basis of Abbé's theory a perfect microscope will separate distinctly two points in the object studied having a linear separation equal to $\lambda/2a$, where λ is the wave length of light used and a is the numerical aperture of the objective. If now we consider a particle which is small in comparison to $\lambda/2a$ it is evident that the microscope will no longer yield a correct delineation of the true form of this particle but will, instead, show a central diffraction disk surrounded by concentric bright and dark rings. As a matter of fact such a particle will be invisible under usual illumination, owing to the glare of light entering the eye. In order to overcome these difficulties Siedentopf and Zsigmondy illuminated the small particles laterally in such a manner that none of the light coming from the condenser would enter the objective directly. Each minute particle thus illuminated scatters light in all directions and hence throws some light upward into the microscope. Upon looking into the microscope the observer sees a number of diffraction disks upon a black background. In other words, the principle is similar to that which enables one to see the dust in the air of a darkened room through which a narrow beam of sunlight is passing. This mode of illumination has been termed "dark-field illumination." Many types of condensers have been devised to accomplish this purpose, the more important types being due to Wenham, Stephenson, Ignatowsky, and Siedentopf and Zsigmondy. The best by far, however, is the "cardioid" condenser developed by Siedentopf himself. A sectional drawing of this condenser is shown in Fig. 8.

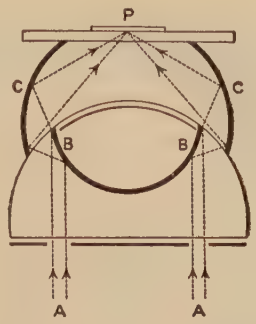


FIG. 8. SECTION OF "CARDIOID" CONDENSER.

A system of parallel rays *AA*, after passing through an annular opening in a diaphragm, is reflected from the convex surface of a sphere *BB*, suffers a second reflection at the concave surface of the cardioid *CC*, and is finally united in a point at *P*. It is evident that the rays, after passing through *P*, cannot enter the microscope objective on account of their great inclination.

A microscope supplied with a condenser producing dark-field illumination is appropriately termed an "ultramicroscope," and the objects thus made visible are termed "ultramicroscopic particles." Of the latter the variety is extremely great. Their dimensions lie between that of the wave length of light and of individual molecules. Characteristic ultramicroscopic bodies are colloidal gold in ruby glass, colloidal silver (Carey Lea's solution), gelatins, albumens, etc. While the size of the diffraction disks due to larger and smaller particles in the same field of view is the same, their intensities differ tremendously, for the intensity of the light scattered is proportional to the square of the linear dimension. Upon this basis a rough determination of the size of the particles may be carried out. The most accurate method, however, consists in ascertaining in advance the mass of the total number of ultramicroscopic particles; then, by counting the number contained in a minute volume of known dimensions and by determining the total volume through which the particles are spread, the average mass of the individual particle may be ascertained. Since, as previously stated, the intensity of the scattered light varies with the square of the linear dimension, eventually a particle, when sufficiently small, will scatter so little light that it is no longer visible. The smallest particles of colloidal gold thus far seen have dimensions of the order of 4 to 7 $\mu\mu$, where 1 $\mu\mu = \frac{1}{1,000,000}$ millimeter.

Bibliography. For the early history of the microscope, the reader should consult Gerland and Traumüller, *Geschichte der Experimentierkunst* (Leipzig, 1899). Drude, *The Theory of Optics*, translation by Mann and Milikan (New York, 1902), and Czapski, *Grundzüge der Theorie der optischen Instrumente* (Leipzig, 1904), treat the theoretical side. A practical and complete treatise is W. B. Carpenter, *The Microscope* (8th ed., ed. by Dallmeyer, Philadelphia, 1901). The more modern developments of the microscope are described in the following articles: Siedentopf and Zsigmondy, "Ultra-mi-

kroskop," *Annalen der Physik*, vol. x (1903); A. Köhler, "Eine mikrophotographische Einrichtung für ultra-violettes Licht ($\lambda = 275\ \mu\mu$)," *Physikalische Zeitschrift*, vol. v, p. 666 (1904); Siedentopf, "Kardioidkondensor," *Berichte der deutschen physikalischen Gesellschaft*, vol. viii (1910). See MICROSCOPY, CLINICAL.

MICROSCOPE, SOLAR. See SOLAR MICROSCOPE.

MICROSCOP'ICAL SOCIETY, THE AMERICAN. An association organized in 1878 and incorporated in 1891, at Washington, D. C. It has a membership of 400. Its objects are the encouragement of microscopical research and the diffusion of knowledge on the subject of microscopy. The society published 34 volumes of *Transactions*, which are now issued as a quarterly journal of microscopy. The Spencer-Tolles Research Fund in 1915 amounted to $5000. Its income is used to stimulate research in microscopic subjects.

MICROS'COPY, CLINICAL. With the rapid increase made in comparatively recent times in the perfection of instruments at our disposal and in our knowledge of the differences in normal and pathological appearances of body tissues and organs and their products, the microscope has come to be an indispensable adjunct to medical diagnosis. (See the article MICROSCOPE for description and illustration of microscopes.) For most diagnostic work two objectives are sufficient—a low power having a focal length of about two-thirds of an inch and a high power having a focal length of about one-fifth of an inch. For a microscopic examination of bacteria and the blood a higher magnification is in many cases desirable.

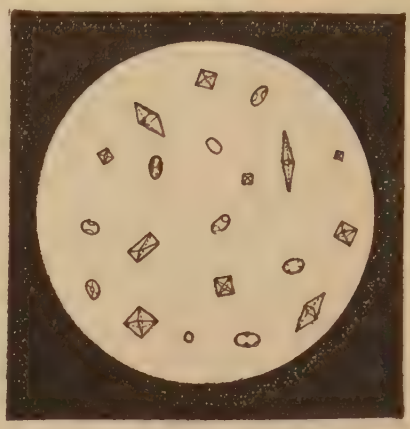
Before examining with the microscope most specimens require some special preparation. As these preparations differ for different specimens, they will be described under separate headings.

Urine. Microscopic examination of the urine is made for the purpose of determining disease

CRYSTALS OF CALCIUM PHOSPHATE × 150.

of the kidney, ureter, bladder, and urethra. For microscopic examination the specimen should be allowed to stand for from eight to twelve hours and the sediment taken by means of a pipette from the bottom of the fluid; or the urinary solids may be precipitated at once by means of a machine called the centrifuge. A small drop of the sedimented urine is placed upon a glass slide and covered by a thin piece of glass known as a cover glass. The specimen may then be examined.

Crystalline Substances.—(*a*) Uric acid occurs as whetstone-shaped crystals. These lying across one another in groups form radiating masses or rosettes. Crystals somewhat dumb-bell in shape are less common, and after the addition of acid to urine large platelike crystals of uric acid may



CRYSTALS OF CALCIUM OXALATE × 350.

be found. (*b*) The salts of uric acid, or urates, may also be seen, usually as a granular deposit—amorphous urates. In urine which is undergoing ammoniacal fermentation ammonium urate crystals occur either as clumps of short thick needles or as rough spherical crystals. (*c*) Hippuric acid crystals are rather infrequently found in acid urine. (*d*) Phosphates, ammonium magnesium or "triple phosphate" crystals, occur in slightly acid and in alkaline urine. They are large and are usually described as "coffin lid" in shape. In alkaline urine the phosphates sometimes come down as fine feathery crystals. Calcium phosphate occurs as clear, slender, needle-shaped crystals. Large colorless platelike crystals of basic magnesium phosphate and granular deposits of the basic phosphates of lime and magnesium may also be found in alkaline urine. (*e*) Calcium oxalate crystals occur in acid urine. They are clear and diamond or envelope shaped. Less common are crystals of a somewhat dumb-bell shape. (*f*) Calcium carbonate is found in alkaline urine which is undergoing fermentation. It occurs as coarse granules

EPITHELIAL CELLS.
a, round; *b*, columnar; *c*, squamous.

which dissolve with gas formation on the addition of acetic acid. (*g*) Less common crystals found in urinary sediments are those of bilirubin, hæmatoidin, leucine, tyrosine, and cystine.

Organic Substances.—(*a*) Epithelial cells, mainly from the bladder and vagina, occur in normal urine. In inflammatory conditions of

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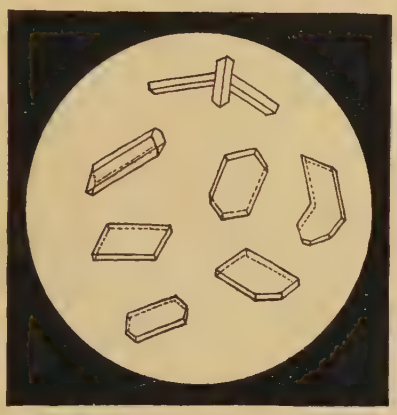

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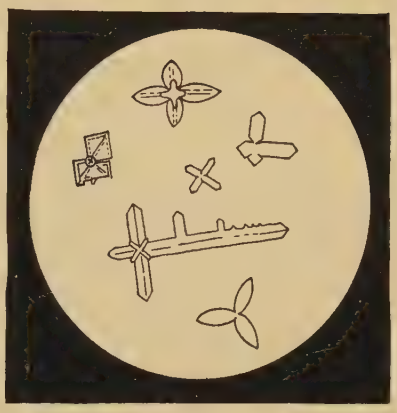

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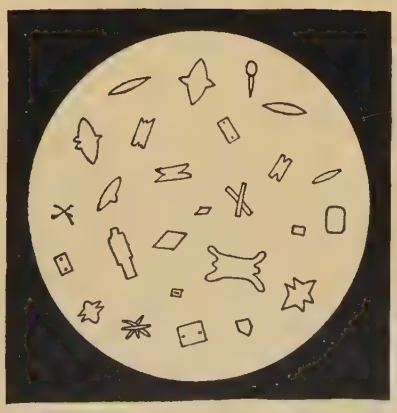

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1. UREA FROM WATER SOLUTION, magnified 25 times.
2. UREA NITRATE, magnified 75 times.
3. UREA OXALATE, magnified 75 times.
4. UREA SODIUM CHLORIDE, magnified 75 times.
5. URIC ACID FROM ACID URINE, magnified 25 times.
6. URIC ACID FROM SNAKE'S EXCREMENT, magnified 200 times.

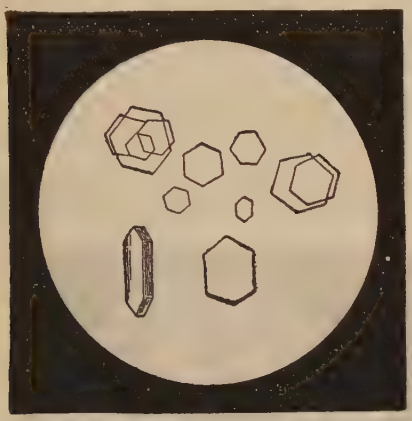
(These figures, together with many of the text illustrations, are from drawings by Prof. C. E. Pellew, and are used by his permission, and that of his publishers, D. Appleton and Co.)

the bladder and vagina their number is greatly increased. Epithelium from the kidney is cuboidal or columnar in shape and most abundant in degenerative conditions of the kidney and in pyelitis. Pigmented columnar epithelium

CASTS.

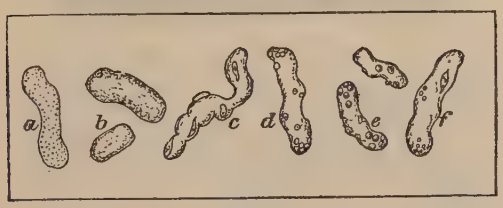
a, hyaline; *b*, waxy; *c*, hyaline and granular; *d*, hyaline and epithelial; *e*, hyaline and blood; *f*, hyaline and pus.

from the seminal vesicles may sometimes be found. (*b*) Casts are among the most important of the organic substances found in urine, indicating parenchymatous inflammation of the kidneys. They are formed by the coagulation of albuminoid matter in the tubules of the kidney. Casts almost clear composed of albumin and a few fine granules are known as hyaline casts.



CRYSTALS OF CYSTIN.

Occurring in small numbers hyaline casts may be of little significance, being present in functional albuminuria, in the urine of old persons, and often in urine otherwise normal. In chronic inflammation of the kidney these casts occur in large numbers. So-called "waxy" casts are less transparent than the hyaline and turn brown



CASTS.

a, fine granular; *b*, coarse granular; *c*, epithelial; *d*, blood; *e*, pus; *f*, fatty.

when subjected to the action of iodine. They are characteristic of the waxy degeneration of the kidney which sometimes accompanies chronic nephritis. Casts containing epithelial cells are known as epithelial casts. They are associated with acute disease of the kidney. Blood casts, or casts containing red blood cells, are found in urine in cases of acute exudative nephritis and in connection with the hemorrhages which sometimes occur. Casts containing pus cells are found in suppurative nephritis and in some of the more severe cases of acute nephritis. Casts containing fine or coarse granules are of frequent occurrence.

Pus cells are found in the urine in the more severe forms of acute nephritis and in suppurative inflammation of any part of the genito-urinary tract. Pus is most abundant in cystitis; less abundant and more thoroughly mixed with the urine in pyelitis; least abundant, and confined mainly to the first part of the specimen passed, in urethritis.

Red blood cells appear as round biconcave disks, about 7 micromillimeters in diameter.

HUMAN SPERMATOZOA GREATLY MAGNIFIED.

a, view of broad surface; *b*, view of profile.

They may be found in severe acute inflammations of the genito-urinary tract and in conditions determining hemorrhage along the tract.

Spermatozoa are frequently found in the urine of healthy individuals. Constant presence of spermatozoa in the urine may occur in certain diseases of the prostate and seminal vesicles. The condition is also frequently present in sexual neuroses.

Yeast and mold plants are frequently found in the urine of diabetics, more rarely in other conditions.

Bacteria.—Normal urine in the normal bladder contains no bacteria. Nonpathogenic bacteria are, however, frequently added to the urine from the urethra or from the external genitals. Of these the *Micrococcus ureæ* is one of the most common. The smegma bacillus is also sometimes present in large numbers and is important from the similarity which it bears to the tubercle bacillus as regards its staining qualities. Among pathogenic bacteria found in urinary sediments may be mentioned the *Staphylococcus pyogenes*, *Streptococcus pyogenes*, the colon bacillus, tubercle bacillus, and gonococcus. In such infectious diseases as septicæmia, pyæmia, erysipelas, diphtheria, and tuberculosis the specific germ of the disease is sometimes found in the urine. For descriptions of the appearance which these different germs present under the microscope the reader is referred to the special articles on the diseases which they cause. For a description of the staphylococcus and streptococcus the reader

is referred to the article on BACTERIA. In examining urinary sediment for bacteria a small amount of the sediment is taken up with a platinum loop and smeared on a cover glass in a thin layer. This is allowed to dry. To fix the specimen, the cover glass is passed through a blue flame of sufficient heat to bring the specimen just to the boiling point of water. The specimen may now be stained by placing upon it a few drops of a watery solution of fuchsine, gentian violet, or methylene blue. After staining it is washed in water and may then be examined.

For other organisms more rarely present in urine the reader is referred to special works upon microscopical urinalysis.

Blood. The main purposes for which blood is examined microscopically are as follows:

1. To count the red blood cells.
2. To determine the amount of hæmoglobin in the red cells.
3. To determine the size, shape, etc., of the red cells and the presence of abnormal forms, e.g., nucleated red blood cells.
4. To determine the number of white cells.
5. To determine the relative proportion of the different kinds of white blood cells—"differential count of leucocytes."
6. For the *Plasmodium malariæ*.
7. In suspected typhoid for Widal's reaction and other agglutination tests.
8. For bacteria and other foreign substances.

For description of the normal histology of blood the reader is referred to the article on BLOOD.

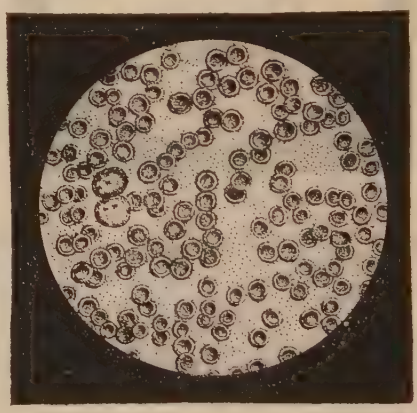
Counting the Red Blood Cells.—This is best accomplished by means of Thoma's hæmatocytometer or blood-counting apparatus. This consists of a pipette with bulb and graduated capillary tube. The graduation of the tube is 0.5 and 1, that of the bulb and tube together 100. By filling the tube to mark 1 with blood and then the bulb and tube to mark 100 with an inert diluting fluid such as normal saline, a dilution of 1 to 100 is obtained. The counting slide has in its centre a round chamber, in the centre of which is a raised flat glass surface which is marked off into 400 equal squares, each of which is one four-hundredth of a square millimeter. The surface of the marked-off area is just one-tenth of a millimeter lower than the surface of the rest of the slide. A drop of the diluted blood is placed upon the centre of the graduated area and a flat cover glass placed over it. As will be seen, the amount of fluid over one of the small squares is one-tenth times one four-hundredth or one four-thousandth of a cubic millimeter. The number of cells in one square is then counted. This multiplied by 4000 and then by the dilution, 100, gives the result desired, i.e., the number of red cells in one cubic millimeter of blood examined. In actual practice a large number of squares is counted and the average taken. The white blood cells may be counted in the same specimen if desired. Owing, however, to their smaller number a larger number of squares should be counted to avoid error. For determining the richness of the individual corpuscles in hæmoglobin, the shape and size of the cells, the relative number of the different kinds of white cells, the presence of the malaria plasmodium, etc., the preparation of fixed and stained specimens is required as follows. Blood from a needle prick is taken up on the end of a glass slide and this is drawn across the surface of a second slide, thus making a thin "smear" of blood. This is dried quickly in the air, after which it is "fixed" by equal parts of alcohol and ether, the vapor of osmic acid or of formalin, or by subjecting to the action of dry heat. The specimen is now ready for staining. A combination of eosin and methylene blue, and Ehrlich's triacid stain, are the most satisfactory. After staining the specimen is washed in water. The eosin-methylene blue method is the most satisfactory for general purposes and stains the malaria plasmodium. Ehrlich's stain is most satisfactory for making a differential count of the leucocytes.

Persistent marked reduction in the number of red cells occurs in primary pernicious anæmia and in the severe secondary anæmias due to some of the infectious diseases. It may also be due to the action of certain mineral poisons (phosphorus, arsenic, etc.), to long-continued suppurative processes, cancer, malaria, conditions of malnutrition, etc.

Loss in the hæmoglobin content of the individual cells occurs especially in that form of anæmia known as chlorosis. Moderate diminution in number of cells may also occur. In leucocythæmia there may also be both a reduction in the number of cells and a reduction in hæmoglobin content. This loss of hæmoglobin on the part of the individual cell is shown in the eosin-stained specimen by an increase in the clear central area of the cell.

Irregular red cells (poikilocytes), small red cells (microcytes), and large red cells (megalocytes) are found in severe anæmias whether primary or secondary.

Nucleated red blood cells are found in all forms of anæmia. As they represent developmental types, their presence may be construed as an attempt on the part of nature to replace lost cells. Very large nucleated red cells (megaloblasts and gigantoblasts) are sometimes present in severe anæmias.



HUMAN RED BLOOD CORPUSCLES AND TWO LEUCOCYTES.

Moderate increase in the number of white blood cells occurs physiologically during the first few days after birth, in the later months of pregnancy, and after eating. Pathological increase in the number of white cells occurs in many of the infectious diseases, especially those accompanied by exudation or suppuration. It is notably absent in typhoid, typhus, tuberculosis, measles, and malaria. Lymphocytosis, or increase in the number of lymphocytes, is

frequent in the later weeks of typhoid, in anæmia, in intestinal diseases of children, and in lymphatic leucocythæmia. Persistent increase in the number of white blood cells independent of other lesions is characteristic of leucocythæmia. This increase may be very great, and is usually irregular, i.e., the proportionate numerical relation of the different kinds of white blood cells is changed. In lymphatic leucocythæmia the greatest increase is in the lymphocytes. In myelogenous leucocythæmia the increase in leucocytes is often enormous, sometimes more than a million per cubic millimeter. Abnormal forms of leucocytes also appear.

In patients suffering from malaria the *Plasmodium malariæ* may be found. The forms which the organism assumes are known as tertian, quartan, and æstivo-autumnal. They occur within the red blood cells, rarely in the plasma.

Free pigment is sometimes found in the blood. This condition is known as melanæmia.

Various foreign bodies, such as fat, bacteria, animal parasites (*Distoma hæmatobium, Filaria sanguinis hominis*, and the eggs of the trichina and echinococcus), endothelial cells, pus cells, tumor cells, etc., are sometimes found in the blood.

Examination of the blood in typhoid for the so-called Widal reaction should be mentioned. The blood or serum to be examined is mixed with ten times its amount of a 24-hour-old broth culture of the typhoid bacillus and examined under the oil immersion lens. A positive reaction consists in the rendering motionless of the bacilli and their collection into groups. If a reaction with the one-to-ten dilution occurs, a one-to-twenty should be tried. Positive reaction with the one-to-twenty dilution makes the diagnosis of typhoid extremely probable. A negative result is of less value.

Stains may be examined to determine the presence or absence of blood, as follows. A drop of normal saline solution to which a few scrapings from the stain have been added is evaporated on a glass slide. This is then covered and a drop of glacial acetic acid allowed to run under the cover. The preparation is next heated until it bubbles. More acid is added and the slide heated until a brownish color appears. The specimen is then slowly dried and mounted in glycerin. If any blood was present it is shown by the presence of small rhombic crystals which result from the conversion of hæmoglobin into hæmin. In cases of suspected rape stains from the clothing or smears from the vagina are examined for the presence of spermatozoa.

Fæces may be examined by mixing a small amount with a drop of normal saline solution on a glass slide and covering with a cover glass. Detritus from incomplete digestion of food forms a large part of normal fæces. Thus, it is common to find in a specimen of fæces vegetable cells of various kinds, starch granules, muscle fibres from meat, fat globules, coagulated albumins, etc. In addition to these there are usually found mucus and epithelial cells, and not infrequently crystals of calcium oxalate, calcium phosphate, calcium sulphate, the fatty acids, triple phosphates, cholesterin, etc.

Epithelial cells in large numbers are frequently associated with intestinal catarrh, especially in children.

Red blood cells may be found in conditions associated with hemorrhage. In suspected cancer or ulcer of the stomach or intestines the search for evidences of "occult hemorrhage" is extremely important.

Pus cells are frequent in catarrhal inflammations of the bowels. They are more abundant when the inflammation is suppurative in character. In typhoid fever and other ulcerative

BACTERIA × 500.

conditions bits of an ulcer which has sloughed or groups of epithelium with pus cells attached may be found in the fæces.

A great variety of bacteria are present in normal fæces. Some of these gain entrance with the food; others exist normally in the gastro-intestinal canal. Among these may be mentioned the *Bacillus coli communis, Proteus vulgaris, Leptothrix*, and the *Bacillus lactis aerogenes*. Under certain as yet little understood conditions it appears that some of these microörganisms may assume a pathological significance.

The typhoid bacillus occurs in the stools of persons suffering from typhoid fever.

Tubercle bacilli may be found in the fæces. (For method of staining, see TUBERCULOSIS.) Occurring with pulmonary lesions and without intestinal symptoms, their source is usually in swallowed sputum. If, however, symptoms of enteritis are associated with tubercle bacilli in the stools, there is certainly a strong probability that the enteritis is tubercular.

The "comma" bacillus is present in the stools of persons suffering from Asiatic cholera.

The *Amœba coli* is found in the fæces in amœbic dysentery. It is best to examine stools for amœba as soon as possible after their passage and on a warm stage, as their motility is a valuable aid in their detection. The presence of hookworm and many other intestinal parasites can only be certainly determined by a microscopical examination of the fæces.

Sputum is examined microscopically to determine the character of the secretion of the respiratory tract. It may be examined by smearing on a cover glass or slide, fixing, and staining with dilute aqueous solution of methylene blue. If there are little lumps of cheesy matter scattered through the sputum, it is well to select one of these from which to make the smear, especially if the tubercle bacillus is to be looked for. Photographs of typical bacteria as seen through the microscope are shown in the article DISEASE, GERM THEORY OF.

Epithelial cells from various parts of the

respiratory tract are often present. Their origin can frequently be determined by their appearance.

Red blood cells occur in the sputum in acute bronchitis, pneumonia, tuberculosis, and in any condition associated with hemorrhage into the respiratory tract.

White blood cells are also readily recognized in methylene blue stained specimens by their irregular or multiple nuclei and their unstained cell bodies. They are found in acute and chronic bronchitis, in pneumonia, tuberculosis, abscess, and gangrene of the lung, in fact in any inflammatory condition of the respiratory tract characterized by a catarrhal or suppurative exudation.

Mucus, fat droplets, fibrin, elastic fibres, crystals of calcium carbonate, triple phosphates, cholesterin, the fatty acids, and the so-called Charcot-Leyden crystals may be found in sputum on microscopical examination.

A large number of harmless species of bacteria are found in sputum, most of these being

YEAST × 250.

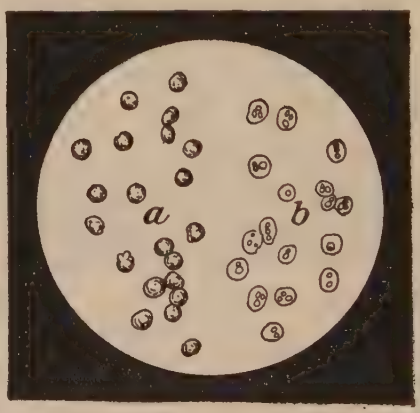
derived from the mouth, nose, and upper respiratory tract. Of disease-producing species the most important are the tubercle bacillus, the bacillus of influenza, the pneumobacillus of Friedländer, the pneumococcus, the streptococcus, and the staphylococcus. (For the staining qualities and appearance of the tubercle bacillus, see article on TUBERCULOSIS.) The bacillus of influenza is an extremely minute bacillus measuring only about half the length of the tubercle bacillus. It is apt to occur in clumps and does not stain very readily with methylene blue. A rather weak solution of carbol-fuchsine, however, gives good staining of the microörganism. The bacillus of Friedländer is the less common of the pneumonic organisms. It is capsulated and decolorizes by Gram's method of staining. The more common cause of pneumonia, the *Pneumococcus* or *Diplococcus lanceolatus*, is also surrounded by a capsule, but is shorter than the Friedländer bacillus and does not decolorize by Gram's method. For the appearance of certain germs, see DISEASE, GERM THEORY OF.

The "ray" fungus, or fungus of actinomycosis of the lung, is sometimes demonstrable in the sputum, as are also yeasts, molds, and *Leptothrix*.

Stomach Contents. Microscopical examination of specimens from the stomach is often of value in determining the condition of that organ. Material is obtained as vomitus or by introducing the stomach tube. Incompletely digested food may be recognized as muscle fibres, fibrous and elastic shreds, fat, starch, and various kinds of vegetable cells. Epithelial cells

MOLD PLANTS × 100.

from the mouth or œsophagus or from the stomach itself may be found. Red blood cells may come from the stomach or may have been swallowed. White blood cells are quite commonly found. The condition of the stomach may sometimes be determined by the forms of microörganism which are found growing there. Thus, a long bacillus which occurs in chains, the so-called Boas-Oppler bacillus, is a common habitant of a stomach free from hydrochloric acid, the contents of which are undergoing lactic-acid fermentation. The Sarcinæ, on the other hand, a species of cocci which hang together in cubes of eight, sixteen, thirty-two, etc., occur in exactly opposite gastric conditions, i.e., where



PUS CELLS.
a, natural condition; *b*, after the addition of acetic acid.

hydrochloric acid is present and lactic acid is absent. Yeasts, molds, and *Leptothrix* are also found.

Exudates. *Serous exudates* usually show little of diagnostic import. After standing or after centrifuging the sediment may show some epithelial cells, red blood cells, leucocytes, fat globules, cholesterin crystals, etc. Bacteria, if

present, are usually in such small numbers as to require culture for their recognition. Fairly frequently, however, the gonococcus may be found in the exudate of gonorrhœal arthritis, by simply staining the sediment. Less frequently the tubercle bacillus may be identified in a similar manner.

Purulent exudates when examined under the microscope show large numbers of pus cells which are mainly polynuclear leucocytes. Red blood cells and exfoliated epithelium are also often present. Of bacteria may be mentioned the tubercle bacillus, the bacillus of anthrax, the diphtheria bacillus, the streptococcus, staphylococcus, gonococcus, and pneumococcus. For methods of examining for tubercle bacillus, see article on TUBERCULOSIS; for streptococcus and staphylococcus, see article on BACTERIA; for pneumococcus, see PNEUMONIA.

The diphtheria or Klebs-Löffler bacillus may be found in sputum. For examination it is usually, however, obtained directly from the suspected membrane. See DIPHTHERIA.

Leptothrix and *Oidium albicans* are organisms sometimes found in exudates associated with diseases of the mouth and pharynx. The former is not infrequently the apparent cause of very obstinate pharyngitis, while the latter is found in connection with the disease known as thrush.

Tissues and Organs. The examination of pieces of tissue or of organs for the purpose of determining the nature of the disease affecting them is often of great importance.

Some tissues may be examined in the fresh state by simply teasing apart in such an inert fluid as normal saline solution (¾ per cent aqueous solution of sodium chloride). The satisfactory examination of most tissues requires, however, a more or less elaborate preliminary preparation. This consists in (1) fixing, (2) hardening, (3) embedding, (4) section cutting, (5) staining, and (6) mounting.

1. *Fixing.*—This consists in placing the tissue, as soon as possible after its removal, in a solution which will kill the tissue elements rapidly, so that they retain the same form and structure that they had during life. Of the most commonly used fixing agents may be mentioned alcohol; formalin, in aqueous solutions of from 2½ to 10 per cent; and Müller's fluid (potassium dichromate, 2.5 grams; sodium sulphate, 1 gram; water, 100 cubic centimeters).

2. *Hardening and Preserving.*—After fixing, tissues are thoroughly washed in running water and then hardened in graded alcohols, i.e., first in 50 per cent, then in 60 per cent, then in 80 per cent. For permanent preservation they are usually left in 80 per cent alcohol.

3. *Embedding.*—This is for the purpose of impregnating the tissues with some substance which will hold them together during the subsequent manipulations. The now most commonly employed embedding mass is celloidin, although for special purposes paraffin is used.

4. *Section Cutting.*—This is now accomplished by means of an instrument known as a microtome. While many of these instruments are quite complicated, the purpose of them all is to carry a knife through the specimen in such a way that sections of any desired thickness may be obtained.

5. *Staining.*—Sections may be stained in a great variety of ways. For general purposes what is known as double staining gives satisfactory pictures. This is accomplished by staining the specimen first in a watery solution of hæmotoxylin and then in an alcoholic solution of eosin. The specimens are next placed in oil of origanum, which removes the alcohol and renders the sections more transparent ("clearing").

6. *Mounting.*—From the oil the section is transferred to a glass slide, the excess of oil removed by blotting with filter paper, a drop of Canada balsam placed on the specimen, and the whole covered by means of a cover glass. This makes a permanent mount.

For other methods of staining and mounting the reader is referred to special textbooks on histology and histological technique.

Bibliography. Böhm-Davidoff-Huber, *Lehrbuch der Histologie des Menschen* (Wiesbaden, 1903); A. B. Lee, *The Microtomist's Vade Mecum* (7th ed., Philadelphia, 1913); J. J. Cammidge, *The Fæces of Children and Adults* (New York, 1914); Dalafield and Prudden, *Pathological Anatomy and Histology* (10th ed., ib., 1914); Charles Hill, *A Manual of Normal Histology and Organography* (Philadelphia, 1914); A. Pappenheim, *Clinical Examination of the Blood* (New York, 1914); Adolf Stöhr, *Lehrbuch der Histologie* (16th ed., Jena, 1915).

MI'CROSOME (from Gk. μικρός, *mikros*, small + σῶμα, *sōma*, body). A name given to minute granules which occur in protoplasm.

MI'CROSPORAN'GIUM (Neo-Lat., from Gk. μικρός, *mikros*, small + σπόρος, *sporos*, seed + ἀγγεῖον, *angeion*, vessel, from ἄγγος, *angos*, jar). When spores become differentiated in size (heterospory, q.v.) the two kinds are produced by different sporangia, and the sporangium producing microspores is the microsporangium. In heterosporous Pteridophytes the microsporangia and megasporangia do not differ in appearance, but differ in the number and size of the spores produced. Among the seed plants, however, the microsporangia are the so-called pollen sacs borne by the stamens. See HETEROSPORY; SPORANGIUM.

MI'CROSPORE (from Gk. μικρός, *mikros*, small + σπόρος, *sporos*, seed). In certain Pteridophytes and in all seed plants two kinds of spores are produced, which differ in size, the smaller being the microspores. In germination a microspore produces a male plant, which is so small that it does not escape from the spore. In the flowering plants this male gametophyte usually consists of three cells or nuclei, and in this same group the microspores have long been called pollen grains. See ALTERNATION OF GENERATIONS; HETEROSPORY; SPORE.

MI'CROSPO'ROPHYLL (from Gk. μικρός, *mikros*, small + σπόρος, *sporos*, seed + φύλλον, *phyllon*, leaf). In those plants which produce megasporangia and microsporangia (q.v.) the sporangia are borne upon foliar structures called sporophylls. The sporophylls bearing the microsporangia are microsporophylls, which in the flowering plants have long been known as stamens. See HETEROSPORY; SPOROPHYLL.

MI'CROTASIM'ETER (from Gk. μικρός, *mikros*, small + τάσις, *tasis*, extension + μέτρον, *metron*, measure). An instrument invented by Thomas A. Edison in 1877 for the purpose of measuring very minute variations of temperature or moisture. The action of the apparatus depends on the effect which the pressure of an expanding rod has upon the electrical resistance of a piece of carbon placed in the circuit of a galvanic battery. A rod of vulcanite is used as the expanding element when it is desired to em-

ploy the instrument to ascertain slight variations in the heat radiation from any object, as the sun or a gas or electric light. This rod is adjusted in a strong frame kept at an equable temperature, so that no expansions or contractions shall exert any influence except those which take place in the vulcanite rod itself. In the chamber which receives one end of this rod or plate there is placed under a follower or slide a piece of carbon, which becomes compressed with great force upon the expansion of the vulcanite rod. If radiant heat is to be measured, a large funnel is placed in front of the apparatus to gather the rays and throw them upon the rod or plate. When the rays increase in intensity the rod expands, compresses the button, and changes its resistance, the variation of which is indicated by a galvanometer. The instrument was used to ascertain the variations in the radiation from the sun during the solar eclipse of July 28, 1878. It may also be used to note the variations taking place on a day when clouds are passing across the sun's disk, or when the transmission of its rays is affected by increase or decrease of moisture. It may be used as a delicate hygrometer by substituting in place of the vulcanite rod a body containing gelatin, which expands under the influence of moisture. The chief disadvantage possessed by this instrument is that the carbon does not regain its original resistance after the pressure is removed. Modern microradiometers and bolometers are, in addition, far more sensitive and are usually employed for the measurement of radiation.

MI'CROTOME. See MICROSCOPE, and Plate of MICROSCOPE.

MICTLAN. See MITLA.

MI'DAS (Lat., from Gk. *Μίδας*). A common name of the more ancient Phrygian kings, of whom Midas, the son of Gordius (see GORDIAN KNOT) and Cybele, is the most famous. According to one legend he captured Silenus by mixing wine with the water of the fountain at which the god drank, and secured for himself the wisdom of the god. Herodotus tells this story as Macedonian, but later writers transferred it to Phrygia. Another version, told by Ovid, *Metamorphoses*, xi, 85–145, and Hyginus, *Fabulæ*, 91, relates that he restored Silenus to Dionysus, and, when asked by the god to name his reward, prayed that whatever he touched might become gold, from which great inconvenience ensued, since even food and drink set before him were changed to gold, so that he was glad to get himself relieved from the burden by washing, at the command of the god, in the Pactolus, the sands of which became thenceforth productive of gold. Another legend represents him as having offended Apollo by assigning the prize in the musical contest to Marsyas, or in later versions to Pan, and as having therefore been endowed by Apollo with a pair of ass's ears. These, concealed under his Phrygian cap, were known only to his barber, who dared tell no man, but, unable to contain his secret, whispered it into a hole in the earth, which he then covered up. His precaution, however, was vain, for the reeds which sprang up at this spot, as they rustled in the wind, proclaimed the news to the world. Some regard this Midas as an ancient Phrygian nature god, probably conceived, like Silenus and other similar fructifying deities, in animal form, but transformed by Greek story-tellers. The story of the ass's ears is a common folk tale. Consult J. G. Frazer, *The Golden Bough*, part ii (London, 1907), and the article "Midas" in Friedrich Lübker, *Realexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MI'DAS. The name of a genus of marmosets, now superseded by other names on the basis of priority, but sometimes the special name of the marakina (*Midas*, or *Leontocebus, rosalia*). See MARMOSET; Plate of MONKEYS, AMERICAN.

MIDDELBURG, mĭd'el-bu̧rk. The capital of the Province of Zealand, Netherlands, situated on the island of Walcheren, 4 miles north-northeast of Flushing (Map: Netherlands, B 3). It is connected with the sea by a canal 5 miles long, which admits ships of heavy burden. The city is surrounded by a broad canal and has handsome houses, ornamented with gardens; the canals and streets are shaded with trees. The town house, built in the sixteenth century, has a beautiful tower and is decorated with 25 colossal statues of counts and countesses of Holland. It contains a museum with old Dutch portraits. At the beginning of the thirteenth century an abbey was founded here, which was later enriched by William II, Count of Holland and Zealand. The buildings are now occupied as the meeting place of the provincial states, and contain tapestries representing battles in the Spanish invasion, and biblical scenes. The new church contains a monument to William II of Holland. The town possesses a dry dock, corn exchange, provincial library, a Gymnasium, a high school, and a normal school, and is the seat of several learned societies, with important collections of antiquities and objects of local interest. The city's commerce was formerly very large. It has some inland trade in grain, potatoes, and madder, and manufactures of cotton goods. Pop., 1903, 19,002; 1910, 19,560. Middelburg was a Hanse town in the Middle Ages, having received its charter in 1225. In 1574, during the war for independence, it was captured by the Dutch from the Spaniards after a siege of two years. It suffered heavily during the wars between England and France in the beginning of the nineteenth century. It was formerly the capital of the province.

MIDDELBURG, PAUL OF. See PAUL OF MIDDELBURG.

MIDDELSCHULTE, mĭd'el-shu̧l'te, WILHELM (1863–). An American organist and composer, born at Dortmund, Westphalia, Germany. He was educated at the Royal Academy of Church Music in Berlin under Haupt, Loeschorn, and Julius Alsleben. He served as organist of St. Lucas's Church, Berlin (1888–91); then settled in Chicago, where he was organist of the cathedral of the Holy Name (1891–95) and of St. James's (Roman Catholic) Church after 1899. After 1894 he was organist for the Thomas Orchestra, and in 1899 he added to his other duties those of director and professor of organ and musical theory at the Wisconsin Conservatory of Music, Milwaukee. He composed *Passacaglia in D Minor*, *Toccata*, and a concerto, a fugue, and a fantasie on themes by Bach.

MIDDENDORFF, mĭd'en-dôrf, ALEXANDER THEODOR VON (1815–94). A Russian traveler and naturalist. He was born in St. Petersburg and studied medicine in Germany. With Baer, in 1840, he went on an ornithological expedition into Lapland, and in 1844–45 made an important trip in northeast Siberia. He again journeyed in Siberia in 1869, accompanied by the Grand

Duke Vladimir; and he also made journeys to Asiatic Turkey and many of the islands off the coast of Africa. His journeys were detailed in government reports and in his book, *Reise in den äussersten norden und osten Sibiriens* (1848–75). He was a member of the St. Petersburg Academy (zoölogical section) and for some time its secretary; founder of the Russian Geographical Society; and in 1846 gold medalist of the London Geographical Society.

MIDDLE AGES. The designation applied to the historical period between the times of classical antiquity and modern times. The beginning and close of this period are not well agreed upon. It is usual, however, to regard the Middle Ages as beginning with the overthrow of the Western Roman Empire by the barbarians in the fifth century and ending at the close of the fifteenth century or the beginning of the sixteenth century. Some scholars prefer to regard the Renaissance (q.v.) as the beginning of modern history. By some, who prefer to use precise landmarks, the Middle Ages are made to extend from the deposition of the Roman Emperor by Odoacer in 476 to the fall of the Byzantine or Greek Empire in 1453, when Constantinople was taken by the Turks. Others again make the Middle Ages terminate with the discovery of America in 1492. The term Dark Ages formerly was frequently used to cover the greater part of the Middle Ages, the designation being applied by some to the period from the fifth to the eleventh century and by others made to embrace all but the last two centuries of the Middle Ages.

In 395 A.D. the Emperor Theodosius died, leaving two sons, one to rule in the West, the other at Constantinople. But in theory there was a single Roman Empire, embracing practically the whole Christian world, extending from the Atlantic to the Euphrates, from the Rhine and the Danube to the great Sahara, with a single government and the same system of laws. Christianity was the recognized state religion. The Roman civilization was in many respects uniform throughout the Empire; a great network of roads bound all the parts together. In the fifth century the Germanic barbarians overran the Western Empire and settled as conquerors in various parts. Thus the three most important factors which were to influence the civilization of western Europe during the early Middle Ages were the Roman, the Christian, and the German. The Roman civilization had absorbed much of Greek art, Greek literature, Greek philosophy, and Greek science. It had developed to a marvelous degree a system of administration and law. It had so completely assimilated the various races in the Western Empire that they were proud to be called Romans. The Christian Church had brought in high ideals and had taught new duties. But at the same time it exalted asceticism, and had a tendency to oppose everything pagan which conflicted with the teachings of the Church. Much of the classical literature and art was under the ban of the Church, because these were intimately associated with the pagan religions. Consequently the Church diminished the inheritance which the Middle Ages would otherwise have received. On the other hand, the Church adopted the magnificent Roman system of administration and thus became a great centralizing governmental force. The German barbarians contributed to the mediæval civilization certain ideas of freedom and of the importance of the individual, as shown in their public assemblies, but the most important contribution was the Germans themselves, a strong race, capable of rapid advance, and always ready to assimilate itself to surrounding conditions. Furthermore, those who settled in the Empire were relatively few in number, and consequently were profoundly influenced by the more numerous population among which they dwelt.

The fifth and sixth centuries were marked by the migrations of the German nations. One tribe after another broke through the Roman frontier and carved out a territory for itself. By 600 almost the whole of the former Western Empire was in the power of the Germans. During the seventh and eighth centuries the Romanic population and the barbarians were going through a process of fusion. By 800 the two formed practically a homogeneous society of a composite nature. The civilization was far higher than that of the early Germans, far lower than that of the Romans. During this period the Church was converting and bringing under its authority the various peoples of the North and West. (See FRANKS.) Its monks were missionaries of culture and also political agents of great importance in binding the separate nations to Rome. From 800 there was again a Roman Empire in the West. (See CHARLES THE GREAT.) Although the Carolingian Empire soon disintegrated, its brief existence had been of great importance as a precedent and had had a lasting effect upon the relations between the Germans and the Roman Catholic church. In the states which arose with the disruption of the Frankish realm the absence of a strong central government threw each district upon its own resources. Local rulers arose, defended their territories against invaders, and maintained a semblance of order. These leaders were sometimes bishops or abbots, sometimes lay nobles. The power fell into their hands. (See FEUDALISM.) The Church was the only bond of union and the only restraining force in the disturbed conditions of the times. It became a mighty engine of government, whose interests were by no means restricted to religious matters. From this time until the close of the thirteenth century the Church was the most important factor in mediæval history. Its authority, wealth, and influence increased constantly; its members were prominent in every sphere of activity.

In the latter half of the tenth century Otho the Great (q.v.) more closely connected the fortunes of Germany and Italy by restoring the Empire of Charles the Great. His action was to result in weakness and disunion for both countries, but for three centuries the German monarch was apparently the leading power in western Europe. During this period the Normans (q.v.) conquered England, southern Italy, and Sicily, and strong monarchies began to develop in England, France, and Spain. Ever since the early part of the eighth century Christendom had been waging a fierce warfare against the Mohammedan power in the West. At the close of the eleventh century began a great onslaught of western Europe upon the Mohammedan power in the East, known as the Crusades (see CRUSADE). The broadening of the horizon, the resultant skepticism, and the enrichment of Europe, which resulted from the Crusades, caused the progress in many lines to be more rapid. The twelfth and thirteenth centu-

ries were periods of great intellectual activity, marked by the foundation of universities, the prevalence of heresy, the development of vernacular literatures, the rise of cities, and the growth of national feeling. The following centuries are generally designated the period of the Renaissance (q.v.).

It is difficult to describe the Middle Ages as a whole, because there was a constant evolution for over 1000 years. The characteristics which contrast most sharply with those of the classical world are these: in the Middle Ages the civilization as a whole was much ruder and mixed with barbaric elements; the individual was of greater importance than the state; men were dominated by a militant, vital religion. If contrasted with the modern period which followed, the Middle Ages were a period when the human intellect was restricted by a deference to the authority of tradition in every phase of life, a deference which was wholly at variance with a critical and skeptical attitude of thought. Again, the physical world, the world of investigation, the world of action, were very limited for the mediæval man. The discoveries at the close of the fifteenth century which disclosed new continents were coincident with the development of the printing press, the revolution in warfare due to the introduction of gunpowder, and the discoveries in the various sciences which opened new worlds of thought and activity. The important artistic activity of the Middle Ages falls into three distinct epochs, the Early Christian (see CHRISTIAN ART), Romanesque, and Gothic, under which titles the art of the period is treated.

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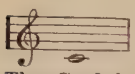
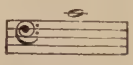
MID'DLEBORO. A town, including several villages, in Plymouth Co., Mass., 35 miles by rail south by east of Boston, on the Nemasket River and on four branches of the New York, New Haven, and Hartford Railroad (Map: Massachusetts, F 5). It has a public library, is an attractive summer resort, and is noted as an industrial centre. Its manufacturing interests are represented by several large shoe factories, woolen mill, paper-box factory, saw and planing mills, and varnish factories. The town receives the income of about $500,000, bequeathed to it by Thomas S. Peirce, a former citizen. The government is administered by town meetings. Middleboro owns its gas and electric-light plants. Pop., 1900, 6885; 1910, 8214; 1914 (U. S. est.), 8778. Settled about 1662 on the site of an old Indian village, Nemasket, Middleboro was incorporated in 1669. Consult Barber, *Historical Collections of Massachusetts* (Worcester, 1840), and Thomas Weston, *History of the Town of Middleboro* (Boston, 1906).

MID'DLEBURY. A village and the county seat of Addison Co., Vt., 34 miles north by west of Rutland, on the Rutland Railroad (Map: Vermont, B 4). The village is situated in the Otter Creek valley, near the Green Mountains, in a region of picturesque scenery. It is the seat of Middlebury College (q.v.), and has the Sheldon Art Museum and Library, a public library, and a fine courthouse and opera house: also attractive fair grounds. The industries are represented by agricultural interests and by several marble quarries, marble mills, limekilns, and flour, saw, door, sash, and pulp mills. The village possesses valuable water power. Under a revised charter of 1877 Middlebury village is governed by a board of trustees, chosen annually, who elect subordinate administrative officers. Pop. (village), 1900, 1897; 1910, 1866. Middlebury was founded in 1773, but, owing to threatened attacks from the English and the Indians, was almost completely deserted during the Revolutionary War. In 1813 it was incorporated as the borough, and in 1832 as the village of Middlebury. Consult Swift, *History of the Town of Middlebury* (Middlebury, 1859).

MIDDLEBURY COLLEGE. An institution for higher learning, founded at Middlebury, Vt., in 1800, and which is under no denominational control. The trustees are elected for life and are not restricted in the choice of their successors. The departments of instruction include French, German, economics, history, political science, pedagogy, philosophy, physics, mathematics, chemistry, biology, geology, home economics, drawing and surveying. The attendance in all departments in 1914–15 was 340, with 31 instructors. The original campus of the college, which was presented to the corporation by Col. Seth Storrs in 1810, was increased in 1908 by a gift from Col. Joseph Battell of 35 acres adjoining. This is used as a site for buildings

for women. In 1912 a further gift of 79 acres was received for the Porter Athletic Field. There are 13 buildings on the campus, of which the most important are Painter Hall (1815), Starr Hall (1861), the chapel (1836), Egbert Starr Library (1900), Warner Science Hall (1901), Hamlin Commons (1882), McCullough Gymnasium (1912), Music Hall (1913), and the Chemistry Building (1913). The State of Vermont in 1908 established a department of pedagogy for the training of high-school teachers, which department is sustained by an annual appropriation. Middlebury College was on the first list of accepted institutions of the Carnegie Foundation and has received a grant from the General Education Board. In 1915 the Mead Memorial Chapel was presented by John A. Mead, former Governor of the State. The college has been coeducational since 1883, but in 1902 a charter was granted by the Legislature authorizing the establishment by the corporation of a separate college for women. The grounds and buildings of the college are valued at $430,000 and the entire property at $1,070,000. The library contains about 45,000 volumes. The president in 1915 was John M. Thomas, D.D., LL.D.

MIDDLE C. In music, the note c^1, which is on the first leger line below the treble staff,  , or above the bass staff  . The C clef always represents the note termed middle C, and the lines and spaces above or below are designated accordingly. See MUSICAL NOTATION, *The Clefs*.

MIDDLE EAR, INFLAMMATION OF. See OTITIS MEDIA.

MIDDLE ENGLISH. See ENGLISH LANGUAGE; ENGLISH LITERATURE.

MIDDLE KINGDOM. A native name of China, believed by its inhabitants to be the middle point of the earth.

MIDDLE LATITUDE SAILING. See SAILINGS.

MID'DLEMARCH. A novel by George Eliot (1872). It appeared serially in *Blackwood's Magazine* in 1871. The author considered this story of a provincial town her greatest work. It consists of two stories, that of the Vincy family and that of Dorothea Brooke, who is the chief character.

MID'DLESBORO. A city in Bell Co., Ky., 64 miles north by east of Knoxville, Tenn., and on the Louisville and Nashville and the Southern railroads (Map: Kentucky, G 6). It has considerable reputation as a summer resort, and contains a Carnegie library, the W. K. Evans Hospital, and commodious city hall and courthouse buildings. The chief industrial establishments include ironworks, coal mines, and a brewery. Pop., 1900, 4162; 1910, 7305.

MIDDLESBROUGH, mĭd'd'lz-b'rŭh. A manufacturing town, port, and parliamentary and county borough in the North Riding of Yorkshire, England, near the mouth of the Tees, 48 miles north of York (Map: England, E 2). It is the centre of the Cleveland iron district, one of the largest in the world. The town is well built, with handsome specimens of architecture, including the town hall with library, a memorial museum, and a Roman Catholic cathedral. In the Royal Exchange, a fine building, the weekly iron market is held on Tuesdays, attended by persons connected with the iron trade from all parts of the Kingdom, as well as foreigners. It is the headquarters of a Roman Catholic bishop. Albert Park, containing 72 acres, is tastefully laid out. The town owns its water, gas, abattoirs, markets, and cemeteries, and maintains baths, washhouses, and free libraries. Middlesbrough was founded in 1830. The opening of the docks in 1842 gave it additional importance. From the year 1852, when iron ore was discovered in the Eston Hills, the town increased rapidly and has acquired an important position as an iron-manufacturing centre, turning out over 2,500,000 tons per year of pig iron alone, and having smelting furnaces on an extensive scale, iron foundries, manufactures of rails, locomotive engines, tubes, boilers, wire, chemicals, salt, oil, and pottery. Shipbuilding is extensively carried on. There are spacious docks, and a breakwater nearly 2½ miles long. The harbor accommodates vessels with a draft of 32 feet. The tonnage entered and cleared, excluding coastwise vessels, was 3,225,000 in 1911. Middlesbrough was incorporated in 1853. Pop., 1901, 91,302; 1911, 104,767. Consult H. G. Reid, *Middlesbrough and its Jubilee* (Middlesbrough, 1881).

MID'DLESEX. The metropolitan county in the southeastern part of England, bounded north by Hertfordshire and south by Surrey (Map: England, F 5). Next to Rutland it is the smallest of the English counties, with an area of 283 square miles, 50 square miles of which comprises a part of metropolitan London. It is generally flat, being watered by the Thames, Colne, Lea, and Brent. Outside of London the land is chiefly devoted to grass and hay farms and to market gardens, the produce of which is sent to supply the metropolis. Capital, Brentford. Pop., 1901 (excluding the metropolitan area), 798,738; 1911, 1,126,465.

MIDDLE TEMPLE. One of the four great guilds or societies of barristers in England, known as Inns of Court. The Inns of the Middle Temple are so called from the group of ancient buildings in London occupied by them, which were the seat of the Knights Templars and passed into the hands of the lawyers after the dissolution of that famous order of chivalry. They are grouped with the buildings of the three other Inns near the Law Courts. See INNS OF COURT.

MID'DLETON. A municipal borough and market town in Lancashire, England, in the valley of the Irk, 6 miles north of Manchester (Map: England, D 3). Its chief industries are the manufacture of cotton, silk, soap, chemicals, and machinery. Much coal is mined near by. It has a fifteenth-century church, a grammar school dating from 1572, a fine town hall, and a technical school. The municipality owns gas works, electric-lighting plant, markets, and public baths, and maintains free library, park, recreation grounds, and a sewage farm. Pop., 1901, 25,180; 1911, 27,980.

MIDDLETON, ARTHUR (1681–1737). An American colonist, born in South Carolina. He was educated in England. After his return to his native Colony he was elected a member of the Commons House, was appointed naval officer for the Colony (1711), member of the Provincial Council (1711–17), and afterward Speaker of the Commons. In 1719 he was president of the convention which took the government of the Colony away from the Lords and placed it directly under the crown. Later he became

president of His Majesty's Council, and as such was acting Governor from 1725 until the arrival of the first regularly appointed royal Governor in 1731. Middleton was an uncompromising supporter of the royal authority.

MIDDLETON, Arthur (1742–87). A signer of the Declaration of Independence, grandson of Arthur Middleton (1681–1737). He was born in South Carolina. In 1754 he went with an uncle to England, where he was educated at Harrow, Westminster School, and St. John's College, Cambridge. He returned to South Carolina in 1763, settled at Middleton Place, on Ashley River, became a justice of the peace, and from 1765 to 1766 served in the Commons for St. Helena. He then again went abroad and spent three years in England and southern Europe. On his return in 1772 he was again elected to the Commons, and in 1774 became a member of the Upper House of the Provincial Congress. He was one of the ablest and boldest opponents of the royal authority, and early in 1775 became a member of the Secret Service Committee and in June of the same year of the Council of Safety. Early in 1776 he helped frame a constitution for the State, and later in the same year he was sent as a delegate to the Continental Congress and signed the Declaration of Independence. In 1778 he was elected a member of the State Legislature and was also chosen Governor and commander in chief of South Carolina, but refused to serve. He assisted in the defense of Charleston, and upon the capture of that place was imprisoned in St. Augustine and later in the prison ship *Jersey*. Being exchanged in July, 1781, he was again elected to the Continental Congress, where he served until peace was declared. Later he became a member of the State Senate and a trustee of Charleston College. Middleton was a man of much energy and judgment, an able debater, and a forceful writer. Under the pseudonym of "Andrew Marvel" he wrote a number of effective political essays; he also left stenographic reports of many of the debates in which he participated.

MIDDLETON, Conyers (1683–1750). A divine of the Church of England. He was born Dec. 27, 1683, at York or Richmond in Yorkshire. He studied at Cambridge, where he took the degree of B.A. in 1702, was elected a fellow in 1706, and shortly after married a lady of fortune. The views he expressed and defended were generally such as to draw down upon him the imputation of being an "infidel in disguise," though some of them—such as that the Jews borrowed some of their customs from Egypt, that the primitive writers in vindicating Scripture found it necessary sometimes to recur to allegory, and that the early stories of Genesis are not literal history—are now commonly held. Middleton died at Hildersham in Cambridgeshire, July 28, 1750. His controversial writings are acute, but marred by bitterness. His principal writings are: *A Letter from Rome, Showing an Exact Conformity between Popery and Paganism; or the Religion of the Present Romans Derived from that of their Heathen Ancestors* (1729), which provoked the most violent indignation among Roman Catholics, and *The History of the Life of M. Tullius Cicero* (2 vols., 1741). All his pamphlets, treatises, etc., were collected and published under the title of *Miscellaneous Works* (4 vols., London, 1752). Consult Leslie Stephen, *English Thought in the Eighteenth Century* (London, 1876).

MIDDLETON, Sir Frederick Dobson (1825–98). A British soldier. He was born in Belfast, Ireland, and, graduating at the Royal Military College at Sandhurst in 1842, saw active service in New South Wales, New Zealand, Burma, and India. In the Indian Mutiny (1857–58) he was decorated with the Victoria Cross for gallant conduct. In 1868 he accompanied his regiment to Canada, but returned to England in 1870. In 1884 he returned to Canada as commander in chief of Canadian militia, and in 1885 he energetically suppressed the Riel rebellion in the Northwest, for which he received from the Canadian Parliament a grant of $20,000 and the honor of knighthood from the Queen. In 1890 he returned to England, and in 1896 was appointed keeper of the crown jewels.

MIDDLETON, George (1880–). An American playwright, born at Paterson, N. J. He graduated from Columbia University in 1902. In 1911 he married Fola La Follette, an actress and writer, the daughter of Robert M. La Follette (q.v.), and a year later became literary editor of *La Follette's Weekly*. His plays, several being dramatized novels, include: *The Cavalier* (1902), with Paul Kester; *The Wife's Strategy* (1905); *The Sinner* (1907); *The House of a Thousand Candles* (1908); *Rosalind at Red Gate* (1910); *The Enemy* (1911); *The Prodigal Judge* (1913). He published: *Embers* (1911), *Tradition* (1913), and *Possession* (1915), all three volumes containing one-act plays; and *Nowadays* (1914), a comedy.

MIDDLETON, Henry (1717–84). An American patriot, born in South Carolina, a son of Arthur Middleton (1681–1737). He was elected to the Commons and served as Speaker of that body in 1745–47 and in 1755–70 he was a member of the Council. He was a delegate to the Continental Congress (1774), serving as president of that body from October of that year to May, 1775. He was also president of the Provincial Congress of South Carolina in 1775–76, and was one of a committee of 11 to prepare a plan of government until the dispute between Great Britain and the colonies could be settled; was elected a member of the Legislative Council in 1776, later of the Council of Safety, and was chosen to the Senate of South Carolina under the new constitution of 1778. He was a wealthy planter and slave owner and a man of marked public spirit.

MIDDLETON, Henry (1771–1846). An American statesman and diplomat, the son of Arthur Middleton (1742–87). He was born in Charleston, S. C., was carefully educated by private tutors and at South Carolina College, and in 1801 was elected to the South Carolina Legislature, where his brilliant powers as an orator attracted wide attention and led, in 1810, to his election as Governor of the State. He held this office until 1812, was a strong supporter of the war policy of the Madison administration, and in 1815, after a brief retirement from politics, was elected to Congress, serving until 1820. In that year he was appointed by President Monroe Minister of the United States to Russia, where in a service of 10 years he did much to strengthen the commercial relations between the two nations, negotiating in 1824 the first treaty which provided for the regulation of trade and fisheries in the Pacific. On his return to America in 1830 he retired from public life.

MIDDLETON, John Henry (1846–96). An English classical scholar, born at York. He studied at Cheltenham College and at Exeter College, Oxford, but ill health prevented his graduating. During this period he read widely in the fields of art and archæology. Afterward he traveled in various parts of the world and returned to become a partner of his father (an architect) at Westminster. In 1886 he was elected Slade professor of fine art at Cambridge, where three years later he became director of the Fitzwilliam Museum. Appointed art director of the South Kensington Museum, London, he carried out various important reforms. He wrote *Ancient Rome* (1885; rev. ed., 1888) and *The Remains of Ancient Rome* (2 vols., 1892), valuable works, giving among other things an excellent account of the building materials used by the Romans and of their methods of constructing walls, arches, buildings, etc. Middleton also published descriptions of collections in the Fitzwilliam Museum.

MIDDLETON, Thomas (?1570–1627). An English dramatist, born probably in London. Hardly a detail of his life is known. He seems to have studied law, and may thus be one of the two Thomas Middletons entered at Gray's Inn in 1593 and 1596. It is thought that he began writing for the stage as early as 1599, but the first mention of him is in Henslowe's *Diary,* on May 22, 1602. He was then collaborating with Munday, Drayton, Webster, and others on a lost play called *Cæsar's Fall.* In this year he published a comedy entitled *Blurt, Master-Constable,* and in 1603–04 two prose tracts, *The Black Book* and *Father Hubburd's Tales,* lively and highly colored satirical sketches of London life. Between this time and his death he wrote more than 20 plays and 12 masques and pageants. In 1620 he was made chronologer to the city of London. He died in London near July 1, 1627. He was successful in both comedy and tragedy. His humor is seen at its best in *A Trick to Catch the Old-One* (1608); *The Roaring Girl* (1611); *The Spanish Gypsy,* a tragi-comedy (acted as early as 1623, but not printed till 1653); *A Chaste Maid in Cheapside* (not printed till 1630). All except the third in this list depict contemporary London life. The second has as heroine the notorious Mary Frith, known as Moll Cutpurse. Middleton's dramatic power is at its height in *Women Beware Women* (first printed in 1657). It is a romantic tragedy founded in part on the history of Bianca Capello. Almost equal to this play are *The Spanish Gypsy,* cited above, and *The Changeling* (printed 1653), considered by some the most powerful of all the plays with which Middleton's name is connected. *A Game at Chess,* a political drama, attacking Spain, aroused such enthusiastic hatred that the Spanish Ambassador protested, and the piece was taken off the stage after scoring a great success (1624). A play called *The Witch* (printed 1778) is of considerable interest because it has the same motive as Shakespeare's *Macbeth.* Middleton is in the forefront of the group of greater Elizabethan dramatists, and there is little, outside the work of Shakespeare himself, which can match the best of his scenes, tragic or comic. The lack of care evident in his plays makes it impossible for them to take the highest rank. Consult: *Works,* edited by Alexander Dyce (5 vols., London, 1840); *Works,* edited by A. H. Bullen (8 vols., ib., 1886); selections from the plays, edited by Havelock Ellis, with an introduction by Swinburne, for the "Mermaid Series" (ib., 1887); P. G. Wiggin, *Inquiry into the Authorship of the Middleton-Rowley Plays* (Boston, 1897); D. H. Jung, "Das Verhältnis Thomas Middletons zu Shakspere," in *Münchener Beiträge zur romanische und Englische Philologie* (Munich, 1904); F. G. Fleay, *Biographical Chronicle of the English Drama, 1559–1642* (2 vols., ib., 1891); A. W. Ward, *History of English Dramatic Literature* (rev. ed., New York, 1899).

MIDDLETON, Thomas Fanshaw (1769–1822). Bishop of Calcutta. He was born in Kedleston, Derbyshire, England; was educated at Christ's Hospital, and graduated at Pembroke College, Cambridge, in 1792; was ordained to a curacy in Gainsborough in 1792, and in 1795 became rector at Tansor, Northamptonshire, and in 1802 at Bytham, Lincolnshire. He exchanged these in 1811 for the curacy of St. Pancras, London. In 1814 he was consecrated first Bishop of Calcutta, where he did much to promote the advancement of Christianity and education, founded the Bishop's Mission College in 1820, and established a consistory court. He was editor for short periods of the *Country Spectator* at Gainsborough and the *British Critic* (new series) in London. The work by which he was best known was that on *The Doctrine of the Greek Article Applied to the Criticism and Illustration of the New Testament* (1808). Consult C. W. Le Bas, *Life of Bishop Middleton* (London, 1831).

MID'DLETOWN. A city and the county seat of Middlesex Co., Conn., 16 miles south of Hartford, on the Connecticut River and on the New York, New Haven, and Hartford Railroad and the line of the Hartford and New York Transportation Company (Map: Connecticut, E 3). It is connected with the opposite town of Portland, known for its brownstone quarries, by an unusually long drawbridge. Middletown is the seat of Wesleyan University (q.v.); the Berkeley Divinity School (Protestant Episcopal), opened in 1854; the State Hospital for the Insane; and the State Industrial School for Girls. Other features are the municipal building, Middlesex Hospital, and the Russell Free Library. The city has considerable trade, as the river is navigable as far as Hartford for light-draft steamers, thus increasing the transportation facilities. Middletown is also an important industrial centre, with manufactures of cotton webbing, hammocks, pumps and pump machinery, marine hardware, locks, woolen blankets, dress shields, canopies, belting, paper boxes, electrical appliances, toys, boots and shoes, chemicals, silver-plated ware, rubber, bone, silk goods, etc. There are valuable mineral deposits in the vicinity, and the region is rich in fruit and tobacco. Middletown is governed, under a charter of 1882, by a mayor, elected biennially, and a city council, chosen on a general ticket. The water works are owned and operated by the municipality. Pop., 1910, 11,851; 1914 (U. S. est.), 12,815.

Founded in 1650 and incorporated as a town under the name of Mattabeseck in 1651, Middletown received its present name in 1653 and was incorporated as a city in 1784. Previous to the Revolution and for some time thereafter it was a very important commercial port, a large number of its citizens being engaged in the West Indian trade. For many years prior to 1886,

when the Custom House was moved to Hartford, it was a port of entry. Consult: Whittemore, *History of Middlesex County, Connecticut* (New York, 1884); an article on "Middletown," in the *Connecticut Quarterly* (Hartford, 1898); C. C. Adams, *Middletown Upper Houses: A History of the North Society of Middletown from 1650 to 1800* (New York, 1908).

MIDDLETOWN. A town in Newcastle Co., Del., 25 miles south-southwest of Wilmington, on the Philadelphia, Baltimore, and Washington Railroad and on the Appoquinomink River. (Map: Delaware, H 2). It has considerable fruit-canning interests, owing to its location in the noted fruit-growing belt of the State, also creameries and vegetable canneries, and manufactures farming implements, shirts, etc. There are municipal water works and an electric-light plant. Pop., 1900, 1567; 1910, 1399.

MIDDLETOWN. A city in Orange Co., N. Y., 67 miles northwest of New York City, near the Wallkill River and on the Erie, the New York, Ontario, and Western, and the Middletown and Unionville railroads (Map: New York, Insert A 1). It is the seat of a State Hospital for the Insane, the largest homœopathic institution in the United States, and has a public library and fine high-school and Federal buildings. The centre of an agricultural and dairying district, Middletown enjoys a considerable trade in the products of the region; and among its industrial establishments are straw-hat factories, car shops (N. Y., O., and W.), saw and file works, cigar factories, a tannery, a milk condensery, and manufactories of shirts, automobile tires, wrapping machines, and cut glass. The city owns and operates the water works. Pop., 1900, 14,522; 1910, 15,313; 1914, 15,650 (excluding over 2000 State Hospital patients); 1920, 18,420. Settled before the Revolution and named from its central location between Montgomery and Mount Hope, Middletown was incorporated as a village in 1848 and was chartered as a city in 1888. Its situation as the halfway station between the Hudson and the Delaware rivers, on the old Minisink road leading to the "far West" of New York State, made it of considerable importance in the later years of the eighteenth and the early years of the nineteenth century; while its position as a terminal of the Erie Railroad and the consequent establishment of a foundry about 1845 gave it a start as an industrial centre.

MIDDLETOWN. A city in Butler Co., Ohio, on the Miami River and the Miami and Erie Canal, 34 miles north of Cincinnati, on the Cleveland, Cincinnati, Chicago, and St. Louis, the Cincinnati, Hamilton, and Dayton, the Cincinnati Northern, and other railroads (Map: Ohio, B 7). It has a public library, a hospital, a government building, and a fine opera house; and there are extensive manufactures of tobacco, paper, bicycles, steel, steel sheets, iron, motor cycles, paper machinery, gas engines, and paper boxes and bags. The water works are owned by the municipality. Middletown was settled as early as 1794, and in 1913 adopted the commission form of government. Pop., 1900, 9215; 1910, 13,152; 1914 (U. S. est.), 14,827; 1920, 23,594.

MIDDLETOWN. A borough in Dauphin Co., Pa., 9 miles southeast of Harrisburg, on the Susquehanna River and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, H 7). It is in a farming region and has flouring and planing mills, stove works, car shops, and shoe, hosiery, cigar, and furniture factories, the products of which constitute a considerable export trade. The electric-light plant is owned by the municipality. Middletown was founded in 1755 and was incorporated as a borough in 1828. Pop., 1900, 5608; 1910, 5374.

MIDDLE TOWN INDIANS. See MIWOK STOCK.

MIDDLE VOICE. See DEPONENT; GRAMMAR, near the end.

MIDDLINGS. See FLOUR.

MIDEWIN, mē′dĕ-wĭn, or **MIDEWIWIN,** mē′dĕ-wē′wĭn, or **MIDE,** mē′dĕ, **SOCIETY.** A secret organization found among many Algonquian (q.v.) Indian tribes, consisting of progressive degrees or ranks having some vague resemblance to the Masonic ritual. In the public initiation ceremonies the candidates spit up shells as proof of their having been magically shot into their bodies, or symbolic of the spiritual influence of the ritual. Consult W. J. Hoffman, in *Bureau of American Ethnology, Seventh Annual Report* (Washington, 1891).

MIDGE (AS. *mycg*, OHG. *muccā*, Ger. *Mücke*, Icel. *my*, midge, fly; connected with Gk. *μυῖα*, *myia*, fly). The popular name of the little flies of the family Chironomidæ, applied also in Europe to the Simuliidæ, which in this country are called black flies and buffalo gnats. There is nothing very specific in the use of the name, and it is generally applied to almost any minute flying insect, most of which are true flies.

MIDHAT PASHA, mē′d′hät′ pä-shä′ (1822–84). A Turkish statesman, born in Constantinople. His origin was humble, but his marked ability secured him rapid promotion in the Ottoman civil service. He visited England and France; was made a Pasha; governed Bulgaria and other provinces with energy and wisdom; and in 1872 was named Grand Vizier. He had already identified himself with the progressive party known as Young Turkey and was disliked and feared by the reactionaries. He took a leading part in the conspiracy which led to the dethronement of Abd-ul-Aziz (May 30, 1876) and was made Grand Vizier, Dec. 20, 1876, by Abd-ul-Hamid II, but was dismissed and banished in February, 1877. A constitution which he had promulgated failed. Later he was permitted to return, and became Governor of Syria and then of Smyrna. In 1881 he was tried, with others, upon the charge of murdering Abd-ul-Aziz and was condemned to death, but the sentence was commuted to perpetual banishment when Great Britain interfered. He died in Arabia, May 8, 1884. He was the author of *La Turquie, son passé, son avenir* (Paris, 1878); Consult: B. Brunswick, *La vérité sur Midhat Pasha* (Paris, 1877); L. A. Léouzon Le Duc, *Midhat Pasha* (ib., 1879); Ali Haydar Midhat, *The Life of Midhat Pasha: A Record of his Services, Political Reforms, Banishment, and Judicial Murder* (London, 1903).

MIDIANITES, mĭd′ĭ-an-īts. The name of a Semitic people. According to Gen. xxv. 2, Midian, the eponymous ancestor, is a son of Abraham through his wife Keturah. That the Midianites are to be reckoned with the Arabs is clear. We find them now at Mount Sinai (Ex. iii. 1), again to the east of Israel (Gen. xxv. 4); in the days of Gideon they advance from the Syrian Desert (Judg. vi), and in Num. xxv. 6–9 they are represented as occupying a portion of Moab. They were evidently in the

main a nomadic people whose general habitat was a region including the northern portion of Hejaz and the fringe of the Syrian Desert east of Edom and Moab. The Midianites east of the Gulf of Akabah seem to have been a pastoral people, while those farther north, whose attacks are described in Judges vi–viii, make the impression of Bedouin hordes. According to Ex. iii. 1, Moses's father-in-law, Jethro, was a Midianitish priest. Grimme has suggested that Midian is mentioned under the form Midhi in a Minæan inscription (Halevy, 535; Glaser, 1155). The land of Midian extended northward from Horeb, or Sinai, close to the eastern shore of the Gulf of Akabah. A place called Madiana is mentioned by Ptolemy close to the Red Sea and about opposite the extremity of the Sinaitic Peninsula, and no doubt this stands in some relationship in the original application of Midian in the Old Testament. Consult: R. F. Burton, *Gold Mines of Midian* (London, 1878); id., *Land of Midian Revisited* (2 vols., ib., 1878–79); Grimme, *Die Weltgeschichtliche Bedeutung Arabiens: Mohammed* (Munich, 1904).

MID'LAND. A town in Simcoe Co., Ontario, Canada, on Georgian Bay and on the Grand Trunk Railway (Map: Ontario, E 4). A line of steamboats runs to Parry Sound. Midland's industrial establishments include three grain elevators, four lumber mills, a blast furnace, iron smelters, woolen and flour mills, engine works, a box factory, a shipbuilding yard, and foundry and machine shops. Power for manufacturing is supplied from the Severn River. Pop., 1901, 3174; 1911, 4663.

MIDLAND. A city and the county seat of Midland Co., Mich., 20 miles northwest of Saginaw, at the junction of the Tittabawassee and Chippewa rivers and on the Pere Marquette and Michigan Central railroads (Map: Michigan, E 5). It has large chemical factories, cement-block works, and a tile factory. The water works are owned by the city. Pop., 1900, 2363; 1910, 2527.

MID'LETON, ninth VISCOUNT. See BRODRICK, WILLIAM ST. JOHN FREMANTLE.

MID-LOTHIAN, mĭd-lō'thĭ-*an*. A county of Scotland. See EDINBURGHSHIRE.

MIDNAPUR, mĭd'nȧ-pōōr. The capital of a district of Bardwan, Bengal, British India, on the Kasai River, 68 miles by rail west of Calcutta, with which it is also connected by a canal (Map: India, F 4). It is an educational centre, with a municipal arts college, high school, public library, central jail, and printing establishments, and is also the seat of an active American missionary settlement. It has manufactures of cloth, baskets, mats, oil, copper, brass, silk, indigo, and timber, and an important trade in rice. Pop., 1901, 33,140; 1911, 32,740.

MIDNIGHT APPOINTMENTS. In American history, a term applied to the court officials appointed under the Act of February, 1801, by John Adams on the last night of his administration as President. The commissions were signed but left undelivered in the executive offices.

MID'RASH (Heb., from *dārash*, to seek, search). The general name given to the exposition of the Old Testament among the Jews. The prohibitions and ordinances contained in the Pentateuchal codes were specified and particularized according to certain hermeneutical rules, and further surrounded by traditional ordinances and inhibitions. This division of Midrash is represented by the Halacha (q.v.), the binding authoritative, civil, and religious law as laid down in the Talmud. Another branch of the Midrash, however, is the Haggada (q.v.), a kind of free poetical homiletics on the whole body of the Old Testament, and the term Midrash without further specification generally refers to this branch of rabbinical literature. The chief collections of this part of the Midrash are *Midrash Rabba* or *Midrash ha-gadol* (on the Pentateuch and the five scrolls) and *Pesikta* to various sections of the Bible. Besides this there are Midrashim to the separate books of the Pentateuch, Exodus, Leviticus, Numbers, and Deuteronomy.

Bibliography. Steinschneider, *Jewish Literature* (London, 1857); Chenery, "Legends from the Midrash," in Löwy, *Miscellanies of Hebrew Literature* (ib., 1877); A. Wünsche, *Der Jerusalemer Talmud in seinen haggadischen Bestandteilen zum ersten Male ins Deutsche übertragen* (Berlin, 1880); id., *Der babylonische Talmud in seinen haggadischen Bestandteilen wortgetreu übersetzt* (ib., 1887–89); Israel Abrahams, *Chapters on Jewish Literature* (Philadelphia, 1899); Herford, *Christianity in Talmud and Midrash* (London, 1904); M. S. Zuckermandel, *Aus Israels Lehrhallen: kleine Midraschim* (Berlin, 1907 et seq.); id., *Tosefta, Mischna und Boraitha* (ib., 1908–09); P. W. J. Fiebig, *Jüdische Wundergeschichten in des neutestamentlichen Zeitalters* (ib., 1911).

MID'RIFF. The diaphragm (q.v.).

MID'SHIP'MAN. In the United States and British navies *midshipman* is the lowest grade of line or executive officers. The title originated in the British navy more than 200 years ago and was derived from the fact that the "young gentlemen" on British men-of-war who were under instruction for the purpose of becoming officers were given quarters *amidships* abreast the mainmast on the lower deck. When the navy of the American Colonies was organized, the practice of the British service was followed as regards this and other ranks. Previous to the Civil War, midshipmen who had finished their course of instruction were called *passed midshipmen* until promoted. A few years after the war the title of midshipman at the Naval Academy, and on probation at sea for two years afterward, was changed to *cadet midshipman*. In 1882 it was changed to *naval cadet*, but in 1902 the title of midshipman was restored. For many years midshipmen served two years at sea after graduation, but now they are commissioned as ensigns as soon as they leave the Academy. See CADET; NAVAL ACADEMY.

MIDSHIPMAN. See SAPO.

MIDSHIPMAN EASY, MR. A story by Frederick Marryat (1836).

MIDSHIPMAN'S BUTTER. See AVOCADO.

MIDSHIPMAN'S HITCH. See KNOTTING AND SPLICING.

MIDSUMMER EVE. See SAINT JOHN'S EVE.

MIDSUMMER NIGHT'S DREAM, A. A comedy by Shakespeare, written about 1595, printed in 1600, when two editions appeared, by Thomas Fisher and by James Roberts, the latter being used for the folio reprint. It is evidently a masque or festival play and is a jumble of classic, mediæval, and fairy lore. The parts of Theseus and Hippolyta may have been taken from Chaucer's "Knight's Tale," but more probably from North's translations of Plutarch's "Theseus" (1579). Pyramus and Thisbe, drawn from Ovid's *Metamorphoses*, may have come

through Chaucer's *Legend of Good Women*, or was based on Robinson's *Handfull of Pleasant Delights*. Oberon, originating in the French *Huon of Bordeaux* in the Charlemagne cycle, is found in Greene's *James IV* (1590). Titania, without the name, can be traced to Chaucer's "Wife of Bath's Tale." Puck is the Robin Goodfellow of old English folklore. The rest of the fairy scenery is Shakespeare's own, except for a slight debt to John Lyly.

MID'WAY ISLAND. An atoll in lat. 28° 14′ N. and long. 177° 23′ W. discovered July 5, 1859, by Capt. N. C. Brooks of the *Gambia* and proclaimed American under the name Brooks Islands, formally annexed and named Midway in September, 1867, by the U. S. S. *Lackawanna*, at which time the Pacific Mail Steamship Company planned a coaling station. Since 1903 it has been continuously occupied as a relay station of the Commercial Pacific cable between Honolulu (1254 miles) and Guam (2593 miles). The atoll is pear-shaped, 2½ miles in its longer dimension, and has two inlets available for small vessels. Its coral wall carries two sandy islets, Middle Brooks or Eastern Island, 15 feet high and 1 mile long, and Lower Brooks or Sand Island, 55 feet high and 1½ miles long. The cable superintendent is a game warden of the Pacific bird reservation. The atoll has been the scene of many wrecks, the most important being the stranding of the mail steamer *Mongolia* Sept. 15, 1906, without loss of life or property. The cable company now maintains a light. Consult "Correspondence Relative to Legislation for Relief of Midway Islands," in 58th Congress, Third Session, *Senate Document 183* (Washington, 1905); and Churchill, "Midway Island" in the *Sun* (New York, March 10, 1912).

MIDWIFE and **MIDWIFERY.** See OBSTETRICS.

MIDWIFE FROG, or OBSTETRICAL TOAD. A smooth toadlike terrestrial frog (*Alytes obstetricans*) of the family Discoglossidæ, found along the Mediterranean coast, and numerous and ubiquitous. From March to August the double call-note of the male, sounding like a

MIDWIFE FROG.

small bell, is heard, but it is difficult to see the performer. The remarkable feature of this frog's life, however, is its egg nurture. When the female is ready to extrude her eggs, which are of large size and attached to one another, in two rosary-like strings, to the number of several dozen, the accepted male mounts upon her back. During the expulsion of the eggs they are fecundated by the male, who then pushes his hind limbs through the tangled mass, after which he releases the female, and retires to his hole dragging with him the burden, wrapped about his legs. He comes out each night to feed and to moisten the eggs in the dew or the nearest puddle, and after about three weeks, when the eggs are nearly ready to hatch, he takes them into the water, where he remains until the tadpoles escape through the softened envelopes. Broods born in early summer mature the same autumn, but later broods remain as tadpoles until the following May. A second species (*Alytes cisternasi*), of similar habits, occurs in Central Spain and Portugal.

MIELATZ, mē'lāts, CHARLES FREDERICK WILLIAM (1860–). One of the foremost American etchers and lithographers. He was born in Breddin, Germany, and came as a boy to the United States. He studied drawing in the Chicago School of Design, and painting under F. Rondel in New York. As a teacher of etching in the National Academy of Design, of which he became an associate member, he exercised a powerful influence upon the younger generation, and for a long time was secretary of the New York Etching Club. Although a master of many techniques, adopting or combining those best suited to the subjects represented, he never parades his craftsmanship. Much of his later work was done in color. His art is virile, his line clean cut and energetic, his presentation fresh and original. He is chiefly known as an etcher of picturesque and interesting views of New York City; such as "The Naval Arch"; "Coenties Slip," a color print; "Entrance to Brooklyn Bridge"; the "Battery"; "In the Bowery"; "New York from Brooklyn Bridge"; "Poe Cottage, Fordham," a large and imposing print; "A Pell Street Balcony," a soft ground etching in color; "High Bridge," a lithograph. For the Society of Iconophiles he designed three important series of lithographs representing views in New York City, one of them after quaint old subjects in Staffordshire ware, printed in blue ink. Among his other works are "The Wave," an aquatint in green and yellow; "Winter Night," an aquatint; "Flowers," a dry point; and "The Passing Storm." His latest important works include a series of etchings of Georgian Court, Lakewood, N. J.

MIER, myâr. A Mexican town, situated on the Rio Grande, 110 miles in a straight line from its mouth (Map: Mexico, J 4). It is noted in connection with an attempted invasion of Mexico by Texans in 1842. Pop., 4000.

MIERES, myā'râs. A mining town of north Spain in the Province of Oviedo. It is situated 9 miles southeast of the city of Oviedo, among forest-covered mountains, and is surrounded by gardens and orchards. It has a score of mines and extensive factories for iron and chemical products. In the neighborhood are important mines of coal, iron, and cinnabar. Pop., 1900, 17,867; 1910, 27,866.

MIEREVELT, mē're-vĕlt, MICHIEL JANSZOON VAN (1567–1641). A Dutch portrait painter. He was born at Delft, and studied under Willem Willemz and A. van Montfoort, called Blocklandt. Mierevelt was the court painter of the house of Orange, and attained celebrity. His portraits are simply and correctly painted and well characterized, but are somewhat cold and hard. Many inferior copies by pupils are also signed by his name. Among his best-known

works are William the Silent and other princes of Orange-Nassau, in the Rijks-Museum, Amsterdam; the poet Jacob Cats (ib.); and Oldenbarneveldt (Louvre). He is also represented by portraits in the galleries at The Hague, Dresden, London, Berlin, and in the Metropolitan Museum, New York. In the hospital at Delft is the "Anatomy Lesson," designed by him and executed by his son and pupil Pieter (1596–1623).

MIERIS, mē'rĭs. A family of Dutch painters. FRANS VAN MIERIS, the elder (1635–81), a genre painter, was born in Leyden, and was a pupil of Torenvliet, of Gerard Dou, and of Adriæn van den Tempel. His pictures are characterized by elegance of line; the color is clear, delicate, and rich, especially in painting velvets, satin, and other rich stuffs. The treatment is too superficial and smooth, however, to be strong. His principal works include the "Lady in the Crimson Jacket," National Gallery, London; "Lady at her Toilet," "Two Ladies Drinking Tea," "Interior of a Household," and a "Male Portrait," in the Louvre; "Boy Blowing Soap-Bubbles" and "The Artist and his Wife" (1663), in The Hague Museum; "Lady Writing a Letter" (1680) and "Lady Playing the Lute," Amsterdam Museum; the "Smoker" (1662) and a "Woman Fainting," Munich Gallery; the "Tinker" and many others in the Dresden Gallery.—JAN VAN MIERIS (1660–90), a genre and portrait painter, son and pupil of Frans the elder; he studied also under Lairesse. Examples of his work are an "Assembly of Ladies and Gentlemen with a Lute-Player," Gotha Museum; "Surgeon Dressing a Wound," Hermitage, St. Petersburg.—WILLEM VAN MIERIS (1662–1747), a genre and mythological painter and sculptor, was born in Leyden, the son and pupil of Frans the elder. His work represents the school in its decline, and is inferior to his father's in drawing and impasto. He also modeled statuettes and vases adorned with bas-reliefs. Among his works are the "Trumpeter," the "Poultry Dealer," and the "Merry Toper," all in the Dresden Gallery.—FRANS VAN MIERIS, the younger (1689–1763). A genre painter and writer. He was the son and pupil of Willem, and a distinguished antiquary, and published works of merit on numismatics and history. His books include the *Historie der nederlandsche vorsten* (1732–35) and *Groot charterboek der graven van Holland, van Zeeland en heren van Vriesland* (1753–56). Among his paintings, which are of an inferior order, are the "Pharmacy" (1714), Amsterdam Museum; portrait of his father (1737), Copenhagen Gallery; and the "Fishmonger" (1747), Rotterdam Museum.

MIEROSLAWSKI, myĕ'rô-släf'skĕ, LUDWIK (1814–78). A Polish revolutionary leader, born at Nemours, France. He was the son of a Polish officer in the service of France, received his education at the military school in Kalisz, and joined the Polish insurgents in 1830. Mieroslawski distinguished himself greatly, and was made an officer, serving until the fall of Warsaw, when he settled in Paris. Here he published a number of books in Polish and French, the most significant of which are: *Histoire de la revolution de Pologne* (vols. i–iii, Paris, 1837; iv–v, 1878); *The Revolution in Posen* (in Polish, ib., 1853). In 1846 he was at the head of another revolutionary movement in Poland, which resulted in his being captured and sentenced to death. From this fate he was rescued by the outbreak of the general revolutionary movement of 1848. After fighting in Posen, Mieroslawski resigned his command in the face of ultimate defeat. In 1849 he participated in the revolutionary movement in Sicily, and after resigning his command placed himself at the head of the revolutionary army in Baden, but eventually retired to Paris. His last appearance as a revolutionist was in Poland in 1863, and, after the failure of that attempt, he spent the last years of his life writing political pamphlets. He died in Paris, Nov. 23, 1878.

MIF'FLIN, FORT. See FORT MIFFLIN.

MIFFLIN, GEORGE HARRISON (1845–1921). An American publisher, member of the firm of Houghton, Mifflin & Company. Born in Boston, and educated at Harvard, he became connected with the publishing house of Hurd and Houghton (1867) and with the Riverside Press; he was admitted to the firm in 1872, and continued a partner in the succeeding firms of Houghton, Osgood & Company (1878–1880) and Houghton, Mifflin & Company (1880–1908). After 1908 he was president of the last-named company. He became president also of the Riverside Press, Cambridge, Mass.

MIFFLIN, LLOYD (1846–1921). An American poet, born at Columbia, Pa. He studied painting under his father, J. Houston Mifflin, a portrait painter and writer of verse, under Thomas Moran (1868–69), and later in Italy and Germany (1870–72). His work was exhibited in the United States, but failing health having forced him to abandon painting he turned to the writing of poetry. Among his numerous volumes of verse are: *At the Gates of Song* (1897); *The Slopes of Helicon, and Other Poems* (1898); *Echoes of Greek Idyls* (1899); *The Fields of Dawn and Later Sonnets* (1900); *Castalian Days* (1903); *The Fleeing Nymph and Other Verse* (1905); *Collected Sonnets* (1905); *Toward the Uplands* (1908); *Flower and Thorn* (1909).

MIFFLIN, THOMAS (1744–1800). An American soldier and statesman. He was born at Philadelphia, of Quaker parentage. He graduated at Philadelphia College in 1760, was a member of the Pennsylvania Legislature in 1772 and 1773, and in 1774 was sent as a delegate to the Continental Congress. Entering the army as a major in 1775, he became Washington's first aid-de-camp with the rank of colonel; was made quartermaster-general in August, 1775; and finally (Feb. 19, 1777) was promoted to the rank of major general and appointed a member of the Board of War. During the retreat from Long Island he commanded the covering party, and afterwards rendered valuable service by rousing the people to enlist, bringing essential aid to General Washington before the battles of Trenton and Princeton. Becoming dissatisfied with Washington's management of the war, he intrigued for his removal, forming with Conway and others the so-called "Conway Cabal" (q.v.), on the failure of which he was replaced (March, 1778) by Nathanael Greene as quartermaster-general, and in October, 1778, was removed from the Board of War. He was elected to Congress in 1782 and became its President the following year. He was a member and Speaker of the Pennsylvania State Legislature in 1785, and a delegate to the Constitutional Convention of 1787. From 1788 to 1790 he was President of the Executive Council of Pennsylvania, and from 1790 to 1799 was the first Governor of the State.

As such he took a conspicuous part in the suppression of the Whisky Insurrection, assuming personal command of the Pennsylvania militia. Consult: Simpson, *Eminent Philadelphians* (Philadelphia, 1859); J. H. Merrill, *Memoranda Relating to the Mifflin Family* (ib., 1890); William Rawle, "Sketch of the Life of Thomas Mifflin," in Historical Society of Pennsylvania, *Memoirs*, vol. ii (ib., 1830).

MIFFLIN, Warner (1745–98). An American reformer, cousin of General Thomas Mifflin. He was born of Quaker parentage in Accomac Co., Va. While a mere boy he became impressed with the wrong of slavery, and about 1774 freed all his slaves and gave them compensation for past services. From that time forward he traveled about frequently to the various meetings of his sect, and did much to create a sentiment against slavery among his fellow Quakers. His religious principles led him to oppose the Revolutionary War, and at the request of the Yearly Meeting at Philadelphia he visited both Howe and Washington in order to point out the wickedness of the struggle. Mifflin is perhaps best remembered for having in November, 1792, presented to Congress a strong memorial against slavery which resulted in a spirited debate over the question of the right of petition. Consult Hilda Justice, *Life and Ancestry of Warner Mifflin* (Philadelphia, 1905).

MIG'DOL. A place in Egypt mentioned in Ex. xiv. 2; Ezek. xxix. 10 (A. V. margin); Jer. xliv. 1 and xlvi. 9. The name is identical with the Hebrew *migdal*, 'tower,' 'castle.' As an appellation it occurs in Egyptian inscriptions as early as the fourteenth century B.C. The exact location of the Migdol referred to in the story of the Exodus is uncertain. It may have been only a guardhouse on the road. A *Makthal* is spoken of in Papyrus Anastasi v. 20 as the "watchtower of Seti," but this place cannot be identified with certainty. From Ezek. xxix. 10 it is evident that a locality in the extreme north of Egypt is intended, as it is contrasted with Syene in the extreme south. In Jer. xliv. 1 it is mentioned in connection with Tahpanhes (Daphnæ) and Noph (Memphis), and in Jer. xlvi. 9 as a place inhabited by exiled Jews. This may be identical with *Magdolo* in a Roman itinerary, possibly at the modern Tell el Her, 12 miles south of Pelusium.

MIGNARD, mē'nyär', Pierre (1610–95). A French portrait and historical painter. He was born at Troyes, studied under Jean Boucher in Bourges and Simon Vouet in Paris, and resided for twenty-two years in Italy, where he was much influenced by the works of Annibale Carracci. At Rome he painted the portraits of Pope Alexander VII and many of the Roman nobility, and at Venice many Venetian nobles. In 1657 he was summoned by Louis XIV to Paris, where he painted the King ten times, Cardinal Mazarin, and many other celebrities. In 1664 he decorated the cupola of the church of Val-de-Grâce, Paris, where he represented a colossal Paradise, with two hundred figures, some of which are three times the size of life. This is the most ambitious fresco decoration in France, but the color has suffered much from time. He also painted decorations in the palace of Versailles. He was famous in Paris as the leader of the opposition against Le Brun and the Academy, but upon the latter's death in 1690 he fell heir to all his positions, becoming director of both the Gobelins and the Academy.

Mignard was the leading French portrait painter of the seventeenth century. His other pictures are rather cold, superficial, and conventional, but his coloring, derived from the Venetians, is good. The Louvre contains a number of his works, including the portrait of Madame de Maintenon, "The Virgin of the Grapes," "Saint Cecilia," and "Saint Luke Painting the Virgin." Others are in the galleries of Versailles, Madrid, St. Petersburg, Vienna, Berlin, London, and Florence. Consult Eugène Lebrun-Dalbanne, *Etude sur Pierre Mignard, sa vie, sa famille, et son œuvre* (Paris, 1878).

MIGNE, mē'ny', Jacques Paul (1800–75). A Roman Catholic editor. He was born in St. Flour, France, Oct. 25, 1800, and was educated at Orléans. In 1824 he became a priest and performed the functions of his office till 1833, when a pamphlet published by him, entitled *De la liberté, par un prêtre*, brought upon him the censure of the Bishop of Orléans, who forbade its publication. Migne went to Paris, and the same year established *L'Univers Religieux* (later called merely *L'Univers*), designed to harmonize the church with the free spirit of civil government. Later he commenced the publication of a collection of works called *Cours complets de théologie et d'écriture sainte*, and founded a publishing house on a large scale called *L'imprimerie catholique*, designed to furnish standard religious works at a low price. He established the daily *Vérité*, which in 1856 became the *Courrier de Paris*. The *Cours complets* finally grew into a very long series of volumes of standard authors under the general head of *Bibliothèque universelle du clergé et des laïques instruits*. The parts which are best known are *Patrologia Latina*, in 221 volumes (Paris, 1844–64); *Patrologia Græca* (Greek and Latin) in 165 volumes (Paris, 1857–66); and *Patrologia Græca* (in a Latin version), in 85 volumes (Paris, 1856–67). They are reprints of the famous Benedictine editions and many others, and, while not perfect, bring together very conveniently well-nigh the whole library of the ecclesiastical writers to Innocent III (d. 1216). His printing establishment suffered severely from fire in 1868, from the Franco-Prussian War in 1870, and from later ecclesiastical opposition. Migne died in Paris, Oct. 25, 1875.

MIGNET, mē'nyā', François Auguste Marie (1796–1884). A French historian. He was born May 8, 1796, at Aix, in Provence, studied law in his native city with his lifelong friend, Adolphe Thiers, and in 1822 went to Paris in order to devote himself to a literary career. He found employment in writing for the public journals, and after giving lectures on modern history, which were received with great approbation, he wrote his *Histoire de la révolution française* (1824). In 1830 Mignet and Thiers in conjunction founded the liberal journal *Le National*. After the revolution of July he became a Councilor of State, and Keeper of the Archives of the Ministry of Foreign Affairs, but he lost these offices in 1848. In 1836 he was received into the French Academy. He edited *Négociations relatives à la succession d'Espagne sous Louis XIV* (1836–42). Other of his works are: *Notices et mémoires historiques* (1843–53, 1854); *Vie de Franklin* (1848); *Histoire de Marie Stuart* (1851); *Charles Quint, son abdication, son séjour et sa mort au monastère de Yuste* (10th ed., 1882); *Eloges historiques* (5th ed., 1884);

and *Rivalité de François I et de Charles V* (1872–75); also a drama entitled *Antonio Perez et Philippe II* (1845–46). Mignet died in Paris, March 24, 1884. Consult: Trefort, *Mignet und seine Werke* (Budapest, 1885); Simon, *Mignet, Michelet, Henri Martin* (Paris, 1889); Edouard Pet, *François Mignet* (ib., 1889); G. P. Gooch, "The Growth of Historical Science," in *Cambridge Modern History*, vol. xii (New York, 1910).

MIGNON, mē'nyôn' (Fr., darling). 1. An Italian girl in love with Wilhelm, in Goethe's *Wilhelm Meisters Lehrjahre* (q.v.). 2. A derisive name applied to the effeminate favorites of Henry III of France. 3. An opera by Ambroise Thomas (q.v.), first produced in Paris, Nov. 17, 1866; in the United States, Nov. 22, 1871 (New York).

MIGNON, mĭn-yông', ABRAHAM (c.1640–79). A German painter, born in Frankfort-on-the-Main. He studied under Jacob Marrel, who took him to Haarlem, where he became the pupil of Jan David de Heem, the celebrated fruit and flower painter. He selected subjects similar to those his master painted, but never equaled him. His composition is more formal, his color less agreeable, and there is too much detail, although his better works are rich, warm, and harmonious. Among his more notable works are a study of flowers, fruit, and other objects, and some "Flowers in a Vase," in the Amsterdam Museum. The Van der Hoop collection in Amsterdam also has a dish with fruit, oysters, and bread, that is more broadly painted than is usual with him. Of his six pictures in the Louvre, two are very fine—a "Bouquet of Wild Flowers" and "Flowers and Fruit." He is also well represented by similar pieces in Dresden, Munich, Brussels, The Hague, Vienna, and other European cities.

MIGNONETTE, mĭn'yŭn-ĕt' (Fr. *mignonette*, dim. of OF., Fr. *mignon*, favorite, dainty, from OHG. *minna*, Ger. *Minne*, love, Icel. *minna*, recollection; connected with Goth. *gamunan*, AS. *munan*, Icel. *muna*, to be mindful, Lat. *mens*, Gk. *μένος*, *menos*, mind, Skt. *man*, to think), *Reseda odorata*. An annual or perennial plant of the family Resedaceæ, a native of the north of Africa, widely cultivated in gardens during summer and in greenhouses and windows during winter for its fragrant flowers. It has lanceolate entire or trifid leaves, and erect terminal racemes of small yellowish-white flowers, which have a six-parted calyx as long as the corolla, and three-toothed capsules. What is called tree mignonette is not even a distinct variety, but merely the common kind trained in an erect form, and prevented from early flowering by pinching off the ends of the shoots. White or upright mignonette (*Reseda alba*), a native of southern Europe, another very popular species, which grows from two to three feet high and bears its white flowers with brownish anthers in dense erect spikes, makes a fine border plant and grows well on ordinary garden soils. The seeds are sown in the open in April or May and later on the plants are thinned to a foot or 18 inches apart. Dyer's weed, or weld (*Reseda luteola*), is a tall species with long spikes of yellowish flowers. All species are generally propagated from seeds, but cuttings are sometimes used.

MIGRAINE, mī-grān' (OF., Fr. *migraine*, from Lat. *hemicranion*, from Gk. *ἡμικρανία*, *hēmikrania*, pain in one side of the head, from *ἡμι-*, *hēmi-*, half + *κρανίον*, *kranion*, head), MEGRIM, HEMICRANIA, SICK HEADACHE. A paroxysmal affection characterized by severe headache, usually one-sided and often associated with disorders of vision. The pain is more frequently left-sided, but the right half or the whole head may be affected. There is an hereditary element in many cases and the disease is apt to become established before the age of 30. Hemicrania has been recognized as a peculiar affection and attempts to explain its origin have continued from the earliest times to the present day. Aretæus and Galen associate it with diseases of the stomach and bile passages, and medical writers generally accepted this explanation up to the end of the Byzantine period. Tissot (in 1784) is credited with the first satisfactory description of the disease. He points out its hereditary character, the fact that the pain may be bilateral, and describes the associated phenomena. Tissot's description remained authoritative until 1873, when Liveing's monograph *On Megrim, Sick Headache, and Some Allied Disorders* appeared, although Vater, Heberden, Schönlein, Romberg, Du Bois Reymond, Claude Bernard, and many other distinguished investigators had also made observations upon the eye symptoms and nervous phenomena. At the present time several theories as to the etiology are put forward, all of which have a reasonable basis. These may be merely mentioned as follows: 1. The toxic hypothesis, which assumes that the irritation is due to poisons formed within the body, giving rise to irritation in the cranial nerves. These poisons have been variously assumed to be uric acid, xanthin, paraxanthin, etc. 2. The vasomotor theory assumes that the essential feature is a vasomotor spasm, followed by dilatation, causing anæmia and hyperæmia alternately, which acts on the nervous tissues and causes the headache. These two theories do not necessarily conflict. 3. The reflex hypothesis implicates the sensory nerves in different parts of the body, such as those supplying the eyes, ears, nose, throat, ovaries, and intestines. 4. Recently (1907) Spitzer advanced the theory that migraine is due to an hereditary or acquired anatomical defect resulting in complete or partial stenosis of the foramen of Monro. Whatever causes a passive or active hyperæmia of the brain in such individuals leads to hyperæmia of the choroid plexus with increased secretion of cerebro-spinal fluid and a more or less complete plugging of the foramen of Monro, followed by a rise of intracranial pressure due to distention of the lateral ventricle. The final result of this is an increase in intracranial tension with pressure on the branches of the fifth nerve supplying the dura mater. From all these theories a fairly correct understanding of the phenomena of migraine may be formed. The essential feature is increased intracranial pressure due to vasomotor changes. These may be brought about either by toxic, mechanical, or reflex influences. Women are the chief sufferers. Migraine is associated with gout, rheumatism, decayed teeth, eye strain, and uterine disorders. It is often due to reflex causes, such as powerful emotions, mental or bodily fatigue, disorders of digestion, and the like. The attacks may be unheralded, but generally there are premonitory symptoms of a widely different character in different individuals. Among these may be mentioned a sense of heaviness, with yawning, chilliness, dizziness, or depression, spasmodic closure of the eyelids, twitching, and various sensory disturbances,

ringing in the ears, irregularity in the taste and smell, and diminution of the saliva. These symptoms may be felt several minutes before the attack or may precede it by hours or several days. The speech may be disturbed, the phenomena being those of sensory aphasia. This, according to Charcot, is an intermittent aphasia, in which the patient can recall the right word at one moment but is unable to do so at the next. In some patients there is a transient loss of memory. Charcot attributes these disturbances to a vasomotor spasm near the speech centre. The headache may originate in the temple, forehead, eyeball, or occiput, whence it spreads gradually over one side of the head, sometimes extending to the neck or even to the arm. The face may be pale or congested and the eyes red; nausea or vomiting appears very early in the attack. Few affections are more prostrating than migraine. The attack endures for a variable time; the sufferer may be incapacitated for a few hours only or for a period of two or three days.

Treatment depends in large part upon the etiology, and is generally satisfactory. Exercise in the open air, moderate diet, hydrotherapy, and other measures tending to stabilize the blood pressure are demanded in most cases. Careful search is made for reflex factors in every part of the body, particularly those parts which are supplied by the fifth cranial nerve, since it is in branches of this nerve that the pain is localized. Ocular troubles, such as refractive errors and muscular imbalance, must be corrected. Points of pressure in the nose must be relieved and active or latent disease of the accessory nasal sinuses cured. The teeth must be thoroughly investigated and search made for cavities, diseased foci, or unerupted molars. An X-ray photograph will often reveal a diseased condition in the teeth or nasal cavities which may otherwise be unsuspected. In rare instances excessive auditory stimulation may bring on an attack. The persistent search for and correction of the above-mentioned peripheral or reflex factors has done far more to cure migraine than any other system of treatment devised. The medicinal treatment is merely symptomatic. The vast number of drugs which are mentioned in this connection attest the inefficiency of this plan of treatment. Among the pain relievers are antipyrine, cannabis indica, and chloroform; nitroglycerin and ergot are used to equalize the circulation, and iron, arsenic, nux vomica, etc., may be given as tonics. Electricity and massage are often helpful. During the paroxysm the sufferer should remain quiet in bed and in a dark room. There is an extensive literature in connection with the subject, most of it German. Consult: Edward Liveing, *On Megrim, Sick Headache, and Some Allied Disorders* (London, 1873); Alexander Spitzer, *Ueber Migräne* (Jena, 1901); George Flatau, *Die Migräne* (Berlin, 1912); Auerbach, *Headache*, translated by Playfair (London, 1913). See HEADACHE.

MIGRA'TION (Lat. *migratio*, from *migrare*, to migrate). The movement of peoples from one place to another, usually, though not necessarily, for the purpose of settlement. Movements of population were no doubt common in prehistoric times, and in the historic period there have been notable migrations that have affected the history of civilization. Students of African ethnology have traced migrations among the negro tribes of that continent that are of importance to the ethnographer; and a more complete knowledge of the ethnology and prehistoric archæology of America will probably make it possible to trace such movements among the American tribes, and perhaps will throw some light upon their origin. Migration has played a large part in theories for the explanation of cultural transmission, but W. H. R. Rivers has recently suggested that cultural traits may be diffused by relatively small groups of wandering immigrants, provided their culture succeeds in profoundly impressing the people with whom they come into contact.

Aryan. The accepted hypothesis until recently was that the so-called Aryan or Indo-European family—embracing the Celtic, Teutonic, Greek, Latin, Balto-Slavonic, Armenian, and Indo-Iranian peoples—originated in the Pamirian region of Central Asia, whence the last-named group moved into India and the Iranian Plateau, while the remaining groups migrated westward, the Celtic peoples leading the way and advancing to central Europe, the Teutons settling about the Baltic, the Greeks and Latins finding their way to the Mediterranean, the Balto-Slavonic to the Baltic Provinces, Lithuania, and the region of steppes and rivers to the southeast, while the Armenians settled near the Caspian Sea. Later investigation of the remains of primitive man in Europe, together with a comparative study of the Aryan tongues, has cast grave doubt upon this theory, and made it seem probable that there never was an undivided Aryan family, unless the term be restricted to the peoples of northern India and Persia, and that the European Aryan groups originated near their present habitats; that the Baltic was the original centre of diffusion of European races, and that the Græco-Latins migrated southward to the Mediterranean and the Indo-Iranians and Armenians southeast into Asia. Another hypothesis locates the original Aryan home in the steppes of southeastern Europe. (See ARYAN; INDO-GERMANIC LANGUAGES.) In prehistoric times the Celtic peoples spread over much of Europe and even into Asia Minor in great migrations. From them the Teutonic tribes acquired much of their civilization. See CELTIC PEOPLES.

German. The migrations of whole Teutonic tribes, during the years of decline of the Roman Empire, had a profound influence upon the social and political development of Europe, and are known preëminently as the migrations (*Völkerwanderung*). These peoples had been on migrations, intermittently, for centuries before the time when Tacitus wrote his *Germania*. In the centuries following the period when he gave his account of them they were engaged in intertribal strife, which resulted in the loss of identity of the weaker tribes, the remnants of which were merged in the new confederacies—Goths, Vandals, Alemanni, Franks, and Burgundians (qq.v.). In the fourth century A.D. the Goths were spread over the country north of the Danube. There came upon them from Asia a great migratory wave of the nomadic Huns (q.v.), a Mongolian people. The Goths (q.v.) were unable to resist this inroad, the Ostrogoths were enslaved by the Huns, but the Visigoths obtained permission from the Roman Emperor to cross the Danube into Roman territory. Because of ill treatment by the Romans they revolted and in the battle of Adrianople (378 A.D.)

annihilated a Roman army and killed the Emperor. But they made peace with the new Emperor, Theodosius, and until his death, in 395 A.D., remained quiet. Then they started on their great migration under Alaric (q.v.), which resulted in the establishment of the Visigothic kingdom in southern Gaul and Spain. This march of the Visigoths was the beginning of "the migrations," and it was soon followed by movements of other Germanic tribes. The Vandals (q.v.), who in the fourth century were settled between the Danube and the Theiss, in 401 A.D. started on their long migration which traversed part of Gaul and Spain and finally led to the establishment of their kingdom in north Africa. The Burgundians (q.v.), who at an early date had migrated from their home between the rivers Oder and Vistula, invaded Gaul early in the fifth century and established a kingdom on the Rhine. After defeats by both the Romans and the Huns the small remnant settled in what is now Savoy. The Ostrogoths (see GOTHS), who were living north of the Black Sea, escaped from servitude to the Huns about the middle of the fifth century. Under Theodoric the Great (q.v.) they invaded Italy, nominally as soldiers of the Emperor, and established there the Ostrogothic kingdom, in 493, after the murder of Odoacer (q.v.). The last great German migration into Italy was made by the Lombards. At the beginning of the Christian era their home was on the left bank of the lower Elbe. Little is known of their wanderings until they reached the Danube about 487 A.D. In 568, under the leadership of Alboin (q.v.), they and their allies, including 20,000 Saxons, crossed the Alps and soon conquered northern Italy, Lombardy. Under "the dukes" they spread over almost the whole of Italy. In the meantime the Franks (q.v.) had gradually extended their conquests and migrations southward. Under Clovis (q.v.) they obtained possession of almost all Gaul. The Angles, Saxons, and Jutes (qq.v.), probably from Schleswig and the neighboring lands, invaded Britain from about 449 to 549 A.D.

The above were the most important of the German migrations. The numbers involved in them were considerable, but not so great as was formerly supposed; no accurate estimate can be given. These migrations show the depopulation of some portions of the Roman Empire, as whole tribes of barbarians found homes without exterminating or driving out the inhabitants. They also show the weakness of the Empire, which was powerless to check these bands encumbered by their women and children and all their property. In the sixth century Justinian (q.v.) reconquered Africa from the Vandals and Italy from the Ostrogoths; the Franks conquered the Burgundians and the Visigoths in Gaul. In the eighth century the Mohammedans conquered the Visigoths in Spain and the Franks subdued most of the Lombards in Italy.

Asiatic. The migrations of the Asiatic peoples are very different from the Teutonic, because they did not carry their households with them. From time immemorial the weaker tribes in the steppes of Central Asia have been driven out from their pastures and robbed of their wives by the stronger, and consequently have been compelled to seek homes elsewhere. While weaker than their conquerors they have been almost invincible to the settled peoples, whose lands they harried by sudden invasions on horseback. When they found a competent leader they made widely extended conquests, enslaving the people and taking their women from them. On the death of the leader the unification frequently ceased and the tribe lost its power. Of this character were all the great invasions of Europe by the nomads, Scythians, Sarmatians, Huns, Bulgars, Avars, Magyars (qq.v.), and Cumans. Of these invasions that of the Huns, in the fourth century, was probably the most influential for European history, as it forced into feverish activity the German migrations. Under Attila (q.v.), in the first half of the fifth century, the Huns built up a strong power in central Europe, but this went to pieces after Attila's death. In the later Middle Ages the movements begun by Genghis Khan (q.v.) had a great effect upon all eastern Europe. Consult: Bryce, "Migrations of the Races of Men Considered Historically," in *Smithsonian Institution, Annual Report, 1893* (Washington, 1894); E. A. Freeman, *Western Europe in the Fifth Century* (New York, 1904); J. A. G. von Pflugk-Harttung, *Great Migrations* (Philadelphia, 1905); A. C. Haddon, *The Wanderings of Peoples* (Cambridge, 1912). See MONGOL DYNASTIES; TIMUR; TURKEY, section *Ethnology*.

The migrations in modern times have been on a larger scale than in the past, and are discussed in the article upon EMIGRATION. For the effects of the Germanic migrations, see EUROPE, section on *History*. For bibliography, see the articles on the various nations and tribes mentioned.

MIGRATION, WAGNER'S LAW OF. In evolution, one of the main agencies leading to the isolation of animals, and consequently to the formation of local races, varieties, and species. This was first pointed out by Moritz Wagner in 1868. He stated his views in three general propositions: (1) the greater the change in the conditions to which individuals are subjected on emigrating to another territory, the more intense must be the inherent individual variability of each organism; (2) the less the even tenor of this increased individual variability of organisms is interrupted by frequent crosses with emigrants of the old stock, the more frequently will nature be successful in forming a new variety or incipient species by the accumulation and inheritance of fresh characteristics; (3) the more advantageous to the variety the change in each single organ, the better it will be able to adapt itself to surrounding circumstances; and the longer the selection of an incipient variety of colonists remains undisturbed by the old stock, the more frequently will a new species arise out of the variety. These laws are fully illustrated by Wagner in his works, and by later observers. Wagner claimed that evolution by natural selection is impossible unless it be assisted by geographical isolation in order to prevent the swamping effects of intercrossing. The numerous facts observed by Wagner and others show that some of the barriers isolating incipient species are broad rapid rivers, oceans, and mountains. He speaks of the extraordinary phenomena of so many species of plants and animals peculiar to the volcanoes and isolated mountains of Quito. "Without the distribution of organisms by migration in connection with local selection it would be inexplicable. The gigantic isolated mountains of this highland act a similar part in the formation of varieties and species as the islands of the archipelago, for instance, of the Galapagos." Wagner also

claimed that adaptation to changed conditions of life and transformation appear to be tantamount to a renovation. Species, he said, which did not migrate, and consequently did not alter in form, became extinct. Consult Moritz Wagner, *The Darwinian Theory and the Law of the Migration of Organisms* (Munich, 1868; trans. by Laird, London, 1873).

MIGRATION OF ANIMALS. The word migration is used in two senses: either to refer to those periodical changes of location such as are made by many species of birds and fishes, by some mammals, and by a few insects, or to those irregular dispersions caused by overcrowding and lack of food or water.

Mammals. Among mammals migrations in the first sense are mainly confined to certain Cetacea, which regularly move from and to the polar seas with the alternating seasons. Regular seasonal movements, truly migratory but short, are practiced by many land animals, especially the herbivores. All deer, goats, sheep, antelopes, and the like, which dwell in mountainous regions, regularly ascend the heights in early summer to get the new grass, find safer solitudes, escape the lowland flies, and otherwise better themselves. In the fall they come down as the snow and cold increase upon the heights, and seek the valleys or the neighboring plains. The American bison formerly was wont to retreat from the mountains to the plains during severe winters, while those on the northerly plains tended to move south. Before the time of railroads the great body of the pronghorns of the plains used to migrate from the northern area of their range to the milder regions south of the Platte River, and returned north in the spring. Still more striking is the regular and prolonged annual migration of the caribou from the Arctic shores of America to the southerly interior, especially in the region north and east of Hudson Bay; they cannot live so far north during the winter, but go back as soon as the snow melts in spring. In all these cases there is an accompanying migration of certain large predacious animals, such as wolves, which depend upon the grazers for food. Similar facts may be cited from the plain regions of Asia, Australia, Patagonia, the Sahara, and South Africa, where seasonal changes, either of cold or drought or the parching of pasturage, compel annual migrations to and from other regions not far distant. It will be seen that these movements are under compulsion of the lack of food (or frequently in desert regions of water), and are continued only when and so far as necessary. Mammals are too slow and hampered in their movements on land to make long, rapid journeys, such as a bird or fish is able to accomplish through the unobstructed air or water; and most mammals either can find food all the year round, or have acquired the power, by storage of provisions or by sinking into dormancy, of tiding over the seasons of scarcity.

Overflows of Mammalian Life. Mammals, including man, take part in certain much more rare but more universal and permanent removals. The most conspicuous instance is afforded by the lemmings of central Norway and Sweden, which at uncertain intervals come down in vast hordes into the lowlands, as is fully described under LEMMING. They travel by night, feed and multiply excessively, and in from one to three years the few which escape the hordes of enemies following them reach the Atlantic or the Gulf of Bothnia. It is believed that these sudden incursions are the dispersal of an overpopulation in the ordinary habitat of the species, due to a combination of favoring circumstances causing an increase of a naturally fecund race until the country cannot longer support the numbers. The animals are started abroad by famine, and continue the flight in aimless restlessness until an equilibrium is restored. The same thing happens occasionally with various other small rodents. "Plagues" of mice have broken out frequently in the grain-growing regions of southern Russia and in other parts of the world. In the western part of the United States, until hunting kept down the stock, there used to be irregular but prodigious movements of squirrels (normally extremely numerous there), which would appear in droves over a wide range of country, all traveling steadily in one direction, until they gradually vanished. The writings of Audubon, Godman, and other early naturalists contain many records of these movements, which did not cease until about 1840. The theoretic and historic incursions of human hosts from Asia into Europe, the spread of the Bantu races which overran Africa, and similar "waves" or "migrations" of conquering men, fall into the same category, but their superior adaptability has enabled them, or some of them, to remain and possess the land.

Insects. The insects afford many cases of mass movements similar to those of mammals, and also a rare approach to true migrations. The swarms of grasshoppers, or locusts, which occasionally visit parts of Africa and Asia, are one of the most familiar phenomena of those regions; and they are accompanied by a rapacious following of birds and mammals feeding upon the traveling hosts of insects, which disperse, dwindle, and finally disappear. In the United States the most disastrous excursions of these insects have been from the Rocky Mountains eastward. They are of irregular occurrence, and the returning swarm the succeeding year is composed only of the descendants of the original emigrants—a fact which contains a hint as to the possible origin of the true migratory habit in others. Irregular movements without, so far as we know, any attempt to return to the original home are illustrated by the army worm, chinch bug (qq.v.), and cotton worm. (See COTTON INSECTS.) These migrations are due to overcrowding and lack of food. There are still slower migrations among insects, which may be termed "spreading." Thus the Colorado potato beetle, a native of the Rocky Mountain plateau, spread eastward, when suitable food was offered it by the cultivation of potatoes, until it now occurs all over the potato region of eastern North America, and, like the brown rat, it permanently occupies all the new territory it enters. A few insects (butterflies) are known to migrate in the sense that fish and birds do.

Reptiles and Fishes. Such phenomena are entirely unknown among reptiles, for obvious reasons, with the possible exception of seagoing turtles, which may withdraw into deeper water or more southerly latitudes in winter than in summer. Many fishes perform long and complex wanderings, but how they are guided in some cases across and up and down the ocean will be a very difficult problem to solve. Salmon and other anadromes come from the sea each spring and ascend hundreds of miles up rivers so as to spawn in places suited to the needs of

the young. The fish so bred return to spawn in the water of their birth, as has been demonstrated by marking smelt that have been transplanted and hatched in rivers previously unoccupied by them; the marked smelt returned from the sea to spawn in the river of their adoption. Experiments upon herring along the Massachusetts coast confirm this conclusion. Sea fishes generally retire to comparatively deep water, and probably many species go southward in winter, while in summer they spread northward and approach the shores, river mouths, or other spawning places. These migrations are induced by reproductive desires and necessities, and the slight variation in the time of the coming of each species, which fishermen expect with fair regularity, seems due to variations in the temperature of the water. It is probable that even these ocean wanderers return to the same part of the coast where they were bred, and that in some cases, as of the Atlantic salmon, exaggerated notions have prevailed as to the distance to which they go in winter. See SALMON.

The Migration of Birds. More conspicuous and interesting, and quite as difficult to explain, are the migrations of the birds, which have been the theme of poetry, homily, and fable, as well as a baffling subject of inquiry, ever since men began to notice the ways of animals.

Most persons have a vague idea that the habit of yearly migration among birds is uniform and universal, but this is not so. Most birds do not migrate at all, and among those that do great diversity exists, so great that the custom seems almost an individual rather than a racial one. The whole body of ratite birds—ostriches, rheas, cassowaries, and the like—are nonmigratory. The fish-eating sea fowl make no more of an annual migration than is necessary to escape from the ice and darkness of their most polar haunts to where there may be open sea. These are wanderers rather than migrants. Gulls and terns, geese, ducks, and the wading marsh and beach birds are in the main migratory, and include some of the most remarkable examples. Of the game birds fewer are real migrants, but here again a few notable exceptions exist, of which one of the most familiar is that of the common European quail, which has been taken so numerously for centuries on both sides of the Mediterranean, and whose migratory flocks still feed travelers wandering in the wilderness of Sinai. The pigeon tribe is sedentary as a rule, also, yet one of its species—the passenger pigeon of North America—has become the very type and exemplar of a migratory bird. Many, but not all, birds of prey regularly migrate, but it is a question whether they do not, in most cases, accompany the movements of the smaller birds rather than travel of their own impulse. Parrots are almost wholly nonmigratory. It is not, then, until we have passed 21 of the 23 classified orders of birds (with the exceptions above noted) that we come to those groups, the picarian and passerine birds, in which the custom of seasonal migration is a prominent characteristic. These are, to be sure, the most numerous as well as the most highly organized orders; yet a large number even here do not migrate at all from temperate regions, but form a resident or partially migrant population in all moderate latitudes, where they remain all the year round. On the whole, the large majority of the total list of the birds of the world are not migratory to any considerable degree.

When we examine the minority which does annually alternate between southerly winter and northerly summer residences many curious facts are discernible. First, it is noticeable that all migratory birds belong to the colder latitudes of the globe; and, on the other hand, that those groups which are wholly nonmigratory represent the primitive types—birds whose ancestry goes back to times when a comparatively warm climate prevailed over the now unbearably cold and sterile polar regions. In general, two-thirds of the birds of the middle temperate zones, both north and south, are migrants, and the total is a very small part of the entire avifauna of the world. Taking up the character of the migratory birds as a class, it appears, first, that they are such as either subsist wholly or mainly on soft-bodied insects—larvæ, worms, and the like—or give their young such fare; second, such as gain their living from fresh or brackish waters or mud, which is likely to freeze; and third, such as follow small birds in order to prey upon them. It is also significantly true that they represent families whose mass and affiliations are found in the tropics, in many cases only one or two species being known elsewhere. Europe's single cuckoo, the eastern North American humming bird, tanagers, orioles, and the like, are familiar and striking examples of this fact. On the other hand, the nonmigratory or resident birds of the temperate zones belong to families mainly distributed outside the tropics and separable, broadly speaking, on other grounds. This state of things points to the explanation that the extratropical parts of the world, depopulated of birds by the cold, ice, and excessive rains of the Pleistocene or Glacial period, were restocked from the crowded intertropical preserves as fast as the amelioration of the climate permitted plants and animals to occupy the temperate and subarctic regions; and that the reactive effect of the new country steadily checked colonization by selecting only those species adapted or adaptive to the new conditions. In this light the seasonal migration of birds must be viewed as an annual excursion, constantly repeated by certain species that have the habit (and not by others), outward from equatorial regions to a greater or less distance poleward.

Beginning of the Seasonal Movement. As the close of the rainy season approaches in the tropics migratory strangers gradually separate themselves from the resident birds, now beginning domestic cares, and disappear. What starts them off just as the rains are bringing an increase of both plant and insect food we do not know. Their ovaries show little preparatory enlargement, and few or none are mated. As they slowly proceed, keeping pace with the lifting sun and the opening spring, they will gradually concentrate upon certain highways, or "migration routes." The old males take the lead, probably merely through superior strength of wing; and it is not until the bulk of these have passed by that the females appear, followed, after an interval, by yearling birds.

The weather encountered, always uncertain, influences this progress decidedly, warm southerly winds encouraging the birds to go forward, while cold spells or northerly storms check them, sometimes for a fortnight or more, and occasionally destroy large numbers. When sunshine and southerly breezes again prevail the accumulated host goes forward in what observers call a "wave" of migration. Such checks are local;

and larger influences have an effect, so that the movement is uniformly earlier in some parts of the continent than in others.

Migration Routes. It is also true that the movement is not uniformly distributed. On the contrary, there are certain definite routes or paths which birds follow in especially great numbers. The greater of these routes, or "fly lines," are generally recognized and seem to be determined partly by topography, but to a greater degree by considerations of security and subsistence. The most thickly frequented routes are along ocean coasts, river valleys, or mountain ranges. European specialists, like Palmen and Middendorf, have outlined several such "fly lines" with great particularity, and when sketched upon a map they are seen to coincide in a general way with the valley system of that continent. Similar highways are traceable in North America. One runs along the Pacific coast and another up the valley of the Rio Grande and along the connected valleys and parks between the parallel ranges of the Rocky Mountains. East of the plains a horde of spring birds enters the United States along the eastern lowlands of Mexico and by way of the West Indies, and soon divides into definite streams of travel. Parted first by the southern extremity of the Alleghanies into two main currents, one goes to the right up the Atlantic coast and through the Hudson Valley and New England, while a second, to the left, ascends the Mississippi, Missouri, and Ohio, diverging more and more up tributary valleys, until all the central and northern parts of the continent are supplied. A little reflection will show how likely, from the nature of the case, are these routes. They are natural bird roads, without obstacles, and they afford easy guidance, plentiful vegetation, and consequent protection against enemies and storms, and the abundance of insect food belonging to watercourses.

Nocturnal and High-Flying Migrants. A large part of the migration of many birds is made at night, especially the natural night fliers, like owls and goatsuckers and the great body of small, timid birds that in their daily life seek concealment and obtain their food in shady, secluded places. It is only the day goers that we ordinarily see migrating, and these more commonly in spring than in fall; but every observer has noted how after a favorable night the woods will be full of birds at dawn where none were to be seen the evening before. English and American ornithologists, led by Baird about 1875, have collected at lighthouses and other watching places systematic data in respect to night migration.

Guidance. What guides these travelers on their annual journeys across continents and over seas? This has been an eager question ever since men began to watch the ways of the birds. If anything approaching a rule has been disclosed it is that diversity prevails rather than uniformity. Birds closely allied in structure, diet, nesting habits, and so forth, vary immensely in the extent and manner of their migrations. While some travel twice a year from the equator to near the poles, others of the same family, or genus even, never leave warm latitudes at all. The increasing perception of this individuality in animals inclines one more and more to believe that migratory birds are guided in the majority of cases by the teaching of their elders, and by their own observation and memory, rather than by any extraordinary faculties or process. Brewster declares that the manner of migration of birds is determined by one, two, or all of the following considerations, viz.: (1) habitual manner of procuring food; (2) disposition; (3) wing power. Much evidence exists in favor of this simple and practical explanation, but unfortunately contrary and unexplained facts still confront us. European ornithologists assert that there the young of many species precede the adults on their journey southward in the autumn. Cooke and Widman, in their elaborate *Report on Bird Migration in the Mississippi Valley*, say the same for the interior of North America. On the other hand, William Brewster, who has observed this matter with the highest zeal and intelligence, maintains the opposite view as the result of long experience in New England and eastern Canada, and declares that the young never precede older birds in the fall, explaining that the first southward flights of adult birds have been overlooked because they were unexpectedly early. He has elucidated this with much detail in the *Memoirs* (No. 1) *of the Nuttall Ornithological Club.*

That this is the true history of migration in respect to many and various kinds of birds cannot be gainsaid; that it is an all-sufficient explanation is not universally admitted. The powers of recognition and recollection involved are doubted by some; yet all animals are strong in this direction—perhaps no mental faculties are so distinctly manifested by brutes as observation and memory. Examples might be drawn from every class, but homing pigeons are most closely to the point. There can be no reason to suppose other birds are less able in this respect until we have taken pains to exploit their abilities. No mysterious "homing faculty" need be summoned. The great height at which pigeons usually fly enables them to survey a wide extent of country and find some points with which they have been previously familiarized; from this a second is visible, and so on, leading the pigeon straight home as the pioneer follows a blazed trail through a forest. Wild birds may be supposed to do the same, and their wish to get a very wide view of the landscape explains the height to which they rise in these journeys and their descent and confusion in murky weather. From a height of 10,000 feet both shores of the Mediterranean, e.g., would probably be visible to a bird's eye, at any rate in the narrower places where they mostly cross. It must be confessed, however, that this explanation does not cover the case of those birds which migrate across ocean spaces of one or two thousand miles. Here it seems necessary to believe that they are guided by an intuitive sense of direction—a *feeling* for the points of the compass, so to speak. Something so closely akin to this instinctive power of orientation is observable among other animals, including the human savage, that it may be very well conceded to the birds. The placing of small, marked metal bands on the legs of young birds has recently been carried on extensively both in the United States and Europe, and has already begun to yield valuable, definite results in indicating the general movements of individual birds.

Bibliography. For references to early essays, and to many essays and books in European languages, consult Newton, article "Migration," in *Dictionary of Birds* (New York, 1893–96), and Giebel, *Thesaurus Ornithologiæ* (Leipzig, 1872–

77); also S. Berthelot, *Oiseaux voyageurs et poissons de passage: étude comparée d'organisme de mœurs et d'instinct* (2 vols., Paris, 1875–76); W. W. Cooke, *Report on Bird Migration in the Mississippi Valley* (Washington, 1888); Palmen, translation by Shoemaker of a report to the International Ornithological Congress at Budapest, 1891, in *Report of the Smithsonian Institution for 1892* (ib., 1893); Gätke, *Die Vogelwarte Helgoland* (Brunswick, 1891), translated by Rosenstock as *Heligoland as an Ornithological Observatory* (Edinburgh, 1895); Whitlock, *The Migration of Birds: A Consideration of Herr Gätke's Views* (London, 1897). This combats many of Gätke's statements and theories. See also C. Dixon, *The Migration of Birds: An Attempt to Reduce Avian Season Flight to Law* (amended edition, London, 1897), an ambitious book of theory, not well sustained; W. E. Clarke, *Studies in Bird Migration* (2 vols., ib., 1912); T. A. Coward, *Migration of Birds* (Cambridge, 1912), containing a bibliography; E. Trouessart, "L'Influence de la guerre sur la faune du pays et les migrations des oiseaux," in *La Natur*, vol. xliii (Paris, 1915). For countless recent articles on migration and bird banding, consult the various volumes of the *Zoölogical Record* (London); Nuttall Ornithological Club, *Memoirs* (Cambridge, Mass.); the *Auk* (ib.); also S. H. Scudder, *Butterflies of the Eastern United States and Canada* (Boston, 1889); F. E. Beddard, *Book of Whales* (New York, 1900); J. A. Thomson, *The Wonder of Life* (ib., 1914).

MIGRATION OF PLANTS. The natural movement of plants from one area to another. This term is thus somewhat in contrast to naturalization (q.v.). Migration of species is possible by reason of variations in the structural adaptations which are found in most plants. Among these perhaps the most important are the structures which are concerned in the dispersal of seeds and spores, which may be scattered by means of birds, wind, or water to very great distances. Besides these methods of dispersal, certain plants may be scattered in a vegetative way for great distances and become established far from the original home. Thus, the common water weed *Elodea* is believed to have spread all over Europe vegetatively from a single plant introduced in the early part of the nineteenth century. It seems likely that after a time a certain equilibrium between the various species of the world will have been reached and that each particular species will be found in the conditions best suited to it. When this time comes further migration would seem to be without result, whether the scattering of seeds takes place or not. It must be remembered, however, that various factors enter in to disturb any equilibrium which may be formed. In the first place, there are changes in the organic world itself; i.e., new species of both plants and animals are developed from time to time through evolution and new disturbances in the so-called equilibrium must arise. In the second place, the external world suffers tremendous changes. It is probably this last cause which has been most responsible for the migration of plants. Through the geological ages continents have arisen and passed away, and all these changes must have been accompanied by changes in the mutual relations of the species then living. Changes in climate have taken place many times in the world's history, and all of these changes must have been attended with great plant migrations. To illustrate: the oncoming of the ice epoch caused a southern movement of the climatic zones, and the species which had become adapted to a particular climate moved south to a greater or less degree *pari passu* with the climatic movement. Postglacial times have witnessed northern migrations, which are necessarily much slower than the northern migrations of the southern zones. Plants must not be regarded as less active migrants than animals, though they make no seasonal migrations.

MIGUEL, mē-gāl′, Dom Miguel Maria Evaristo de Bragança (1802–66). An aspirant for the Portuguese throne, the third son of John VI of Portugal. He was brought up in Brazil, whither his parents had fled in 1807, and returned to Portugal in 1821 with very little education, a debauchee and a superstitious bigot. He put himself at the head of the reactionary party and plotted the overthrow of his father and of constitutional government. In 1824 he caused his father to be closely guarded, arrested the ministers, and sought to overthrow the government, but failed and was sent into banishment. In 1826 his brother Dom Pedro, Emperor of Brazil, succeeded to the throne. He relinquished the crown of Portugal to his young daughter, Dona Maria da Gloria, and betrothed her to her uncle Miguel, who was made regent. Dom Miguel in 1828 usurped the throne, abolished the constitution, and introduced a reign of terror. Dom Pedro, who had been forced to abdicate the throne of Brazil in 1831, placed himself in 1832 at the head of an expeditionary force, which had been collected by the opponents of Dom Miguel, and proceeded to dethrone the usurper. He entered Oporto in July, and a year later, after the defeat of Dom Miguel's fleet, was in possession of Lisbon. Spain recognized Maria as the legitimate sovereign. England and France followed suit, and Dom Miguel was forced to give up all claims to the crown (1834). He died at Brombach in Baden. To the common estimate of Dom Miguel's character exception is taken by Cardinal Hergenröther in the *Handbuch der allgemeinen Kirchengeschichte*, vol. iii, p. 847 ff., (3d ed., 1886), where he is said to be a noble prince, possessing the affection of his subjects.

MIHRAB, mē-räb′. See Kiblah; Mosque.

MIJATOVICH, mē-yä′tō-vĕch, Chedomille (1842–). A Servian diplomat and author. He was born in Belgrade; studied at Munich, Leipzig, and Zurich; taught economics at Belgrade (1866); and was general secretary in the Servian Ministry of Finance from 1869 to 1871 and Minister of this department in 1873–75 and of Foreign Affairs as well as Finance in 1880. About 1874 he broke with Ristič, in whose cabinet he had served, and joined the Progressive party. From 1875 on he was a Senator of the Kingdom of Servia. In 1886 he represented Servia in making peace with Bulgaria; in 1894 was Minister of Finance again and Ambassador to Rumania; in 1899 was delegate to The Hague Peace Conference; and in 1895–1900 and (after serving at Constantinople) in 1902–03 was Minister from Servia at the Court of St. James's, resigning after the assassination of King Alexander, which he described in *A Royal Tragedy* (1906). He wrote *Servia and the Servians* (1908), *Servia of the Servians* (1913), and, in Servian, several volumes of history, economics, and fiction. His English wife, Elodie Lawton (died 1908), wrote a *History of Modern Servia* (1872) and *Serbian Folk Lore* (1874).

MIKADO, mē-kä′dō (Jap., Exalted Gate). Formerly the popular and official title of the Emperor of Japan, occurring in poetry and history throughout the whole range of Japanese literature. Though comparatively obsolete in the Japan of the twentieth century, the word has found a fixed and honored place in the English language. The Mikado dynasty is probably the oldest in the world, Yoshihito (q.v.) being reckoned by most authors the one hundred twenty-second of the Imperial line, the first being Jimmu Tenno, who in the official chronology began to reign 660 B.C. Descent is claimed from the gods that created heaven and earth. The origin of the line is lost in mythology, and there is little or no historical foundation for it before the fourth century. The first 17 mikados (660 B.C.–399 A.D.) are said to have died at ages ranging from 100 to 141 years. The average reign in the whole line is 20 years. Each mikado has a personal name, but no family name, nor is the name of the mikado ever repeated. Each has also a posthumous title, by which he is known in history. Seven of the mikados were women. See MEIJI TENNO.

MIKADO, THE. A comic opera by William S. Gilbert and Sir Arthur S. Sullivan (qq.v.), first produced in London, March 14, 1885; in the United States, Aug. 19, 1885 (New York).

MIKAL. See LEBENSOHN, MICAH JOSEPH.

MIKA′NIA (Neo-Lat., named in honor of J. C. Mikan, a Bohemian botanist of the nineteenth century). A genus of plants of the family Compositæ, nearly allied to *Eupatorium* (q.v.). *Mikania officinalis* is a Brazilian species, with erect stem and heart-shaped leaves, abounding in a bitter principle and an aromatic oil, reputed useful in medicine. *Mikania amara* and *Mikania cordifolia* (twining herbs), also natives of the warm parts of South America, are among the plants which have acquired a high reputation—deserved or undeserved—for the cure of snake bites. The former is remarkable for the large indigo-blue spots on the underside of its ovate leaves. *Mikania scandens*, sometimes called climbing hempweed, is a native of the United States, growing in moist soils from New England to Texas.

MIKHAILOFF-SHELLER, mē′kä-yīl′ŏf-shĕl′lēr, ALEXANDER. See SHELLER, ALEXANDER KONSTANTINOVITCH.

MIKHAILOV, mē-kä-yīl-ŏf, MIKHAIL LARIONOVITCH (1826–65). A Russian journalist and novelist, born in the Ural Mountains. He was educated in St. Petersburg and began his literary work with translations, chiefly from Heine. These were collected in one volume (1858), and his articles for the *Sovremennik* (*Contemporary*) and other periodicals, as well as his stories, notably *Adam Adamovitch* (1851), were published in two volumes in 1859. He shared the dreams of the revolutionists of his own country and was exiled to Siberia, where he died.

MIKHAILOVSKI, mē′kä-yīl-ŏf′skē, NIKOLAI KONSTANTINOVITCH (1842–1904). A Russian essayist, critic, and sociologist. He translated one of Proudhon's works into Russian, but it was his critical work on the famous *Annals of the Fatherland* (*Otĕčestvennya Zapiski*), with which he was connected from 1869 to its suppression in 1884, that made him famous. For it he wrote literary notes regularly, beginning in 1872, and many papers, on truth, heroes, and the crowd, Darwinism, Socialism, positivism, and the systems of Spencer and Mill. In 1873 he became one of the editors of the *Northern Messenger* (*Sĕvernvi Vĕstnik*), and from 1890 to his death he edited the *Russkoe Bogatstvo* (*Russian Wealth*). Mikhailovski's best-known monograph is on *The True Nature of Progress* (trans. into French by Louis, *Qu'est-ce que le progrès?* 1879). Mikhailovski rejects the organic conception of society and holds that social processes are not wholly reducible to biological or intellectual terms. Social progress, in his view, presupposes social justice—the proper division of labor—and is brought about through the conscious and sympathetic coöperation of the individuals striving to realize their full measure of individuality. The end of progress is the identity of truth and justice (Russ., *pravda*). Mikhailovski also wrote several literary studies, notably on Tolstoy (1887) and Shtchedrin (1890). His papers have been collected several times, the latest edition of his *Works* being prepared by Kolosov (St. Petersburg, 1913).

MIKHAILOVSKI-DANILEVSKI, mē′kä-yīl-ŏf′skē dä′nē-lyĕf′skē, ALEXANDER IVANOVITCH (1790–1848). A Russian soldier and historian. He took part in the war with France (1812–13) as Kutusoff's aid-de-camp and was head chancellor of Wolkonski in 1813–14. In the war with Turkey (1829) he served as major general, was promoted to be lieutenant general in 1835, and became a member of the war council and Senator in 1839. He wrote a *History of the Turkish War of 1806–12* (1843), besides accounts of his experiences in the campaigns of 1812–13 (1834) and of 1814–15 (1849–50). His collected works were published (1849–50) in seven volumes. They are marked by a freedom of style and a patriotic sentiment that sometimes verged into inaccuracies.

MIKKELSEN, mīk′kel-sĕn, AKSEL (1849–). A Danish educator, born at Hjörring, the introducer and organizer of sloyd schools in Denmark. In 1872–83 he operated a machine shop, later he organized sloyd schools, finally the Sloyd Seminary in Copenhagen, and in 1907 he was appointed sloyd inspector for Denmark. Through his energetic work as teacher, author, and lecturer he greatly developed this form of education throughout the country. Among his many writings on the subject are: *Hvad er Slöid?* (What is Sloyd?) (1886); *Hvordan arbeider Slöidskolen?* (How Does the Sloyd School Work?) (1886); *Slöidlære* (Instruction in Sloyd) (1894); *Arbeidsstillinger* (Positions when Working) (1896).

MIKKELSEN, EJNAR (1880–). A Danish explorer, born at Vester Brönderslev, Jutland, who served in the Amdrup expedition to Christian XI Land, East Greenland (1900), and in the Baldwin-Ziegler expedition to Franz Josef Land (1900–02). With Leffingwell he organized the Anglo-American polar expedition which wintered at Flaxman Island, Alaska, in 1906–07. They lost their ship, but in a sledge journey over the ice they located the continental shelf of the Arctic Ocean, 65 miles offshore, where in 2 miles the sea increased from 50 meters to more than 690 meters in depth.

Organizing an expedition to map out the northeast coast of Greenland, to recover the bodies of Mylius-Erichsen (q.v.) and Lieutenant Höeg-Hagen and their records, Mikkelsen wintered (1909–10) at Shannon Island, East Greenland. His ship sank, and the rest of the party returned home on a whaler. Remaining with his engineer, Iversen, Mikkelsen succeeded

by a series of most remarkable and hazardous sledge journeys in recovering the lost records and in disproving the existence of Peary Channel. The two explorers, who later wintered at Shannon Island, were rescued, when in the direst of extremities, by a Norwegian whaler (1912). Mikkelsen's writings are: *Conquering the Arctic Ice* (1909); *Lost in the Arctic* (1913; Ger. trans., 1913); "Mylius-Erichsen's Report on the Non-Existence of Peary Channel," in *Meddelelser om Grönland*, vol. xli., (1913); *The aar paa Grönlandsöstkyst* (1914).

MIKLOSICH, mĭk'lō-shĭch, FRANZ VON (1813–91). A famous Slavic philologist of Slovene nationality. He was born in Luttenberg, Styria, studied law at Gratz, and settled to practice in Vienna in 1838. There the famous Kopitar (q.v.) aroused in him an interest in Slavic philology, and he first attracted attention by his review of Bopp's *Comparative Grammar* in 1844. Henceforth he devoted himself to philology, and until his death his productivity was enormous. In 1844 he obtained a position in the Imperial Library and in 1850 was made professor of Slavic philology in the University of Vienna, retaining his post until 1886. He was also government censor of Slavic, Rumanian, and Greek publications. His scientific career is remarkable for profundity of research. Miklosich is not only the founder of modern Slavic philology, but he also greatly promoted the historical study of the Albanian, Gypsy, Hungarian, modern Greek, and Rumanian languages. Aside from numerous articles on special points of phonetics, syntax, archæology, etc., chiefly published in the *Denkschriften* and the *Sitzungsberichte* of the Vienna Academy of Sciences, the most important of his works are: *Vergleichende Grammatik der slawischen Sprachen* (1852–74; 2d ed. of vols. i, iii, iv, 1876–83); *Formenlehre der altslowenischen Sprache* (2d ed., 1854); *Lexicon Palæoslovenico Græco-Latinum* (2d ed., 1865), one of the best of its kind for completeness and the abundance of material; *Altslowenische Formenlehre in Paradigmen* (1874); *Altslowenische Lautlehre* (3d ed., 1878); *Etymologisches Wörterbuch der slawischen Sprachen* (1886). Miklosich also edited several important texts, such as: *Apostolus* (1853); *Lex Stephani Dušani* (1856); *Monumenta Linguæ Palæoslovenicæ e Codice Suprasliensi* (1857); *Monumenta Serbica* (1858); *Acta et Diplomata Græca Medii Ævi* (1860–87), with J. Müller. Consult: Jagić, *Entsiklopediia Slavianskoi Filologii*, vol. i (St. Petersburg, 1909).

MIKLUCHO-MACLAY, mē-klōō'kō-mâ-klī', NIKOLAI (1846–88). A Russian traveler and ethnographer, born in the Ukraine of a noble family. He studied medicine and zoölogy at St. Petersburg and in Germany. After traveling widely in Europe he went with Haeckel to Madeira (1866), visited the Canary Islands in 1867, and after a trip to Morocco in 1870 undertook a great anthropological tour in Oceanica. At Sydney he founded a museum and zoölogical station and in 1885 returned to St. Petersburg, where he died before he had classified his collections. He wrote on his travels in New Guinea in Petermann's *Mitteilungen* (1874, 1878) and on the temperature of oceanic depths for the *Bulletin* of the St. Petersburg Academy (1871), and made many other contributions to technical journals in Europe, Asia, and Australia.

MIKNAS, mĭk'nâs. A town of Morocco. See MEQUINEZ.

MIKOVEC, mē'kō-věts, FERDINAND BRETISLAV (1826–62). A Bohemian dramatist and archæologist, born at Bürgstein and educated at Česká Lípa and Prague. He founded the literary journal *Lumír* (1851–64) and edited two volumes of Bohemian antiquities under the title *Starožitnosti a památky země české* (1858–64). He wrote the tragedies *Záhuba rodu Přemyslovského* (The Fall of the Přemyslids, 1851), *Dimitri Ivanovič* (1856), and other dramatic works.

MILAN, mĭl'an *or* mĭ-lăn' (It. *Milano*, Lat. *Mediolanum*). The second-largest city in Italy, the chief city in Lombardy, and the capital of the Province of Milan. It is situated in the great plain of Lombardy, 400 feet above the sea, on the little river Olona, an affluent of the Po, 93 miles northeast of Turin and 166 miles west of Venice; lat. 45° 28′ N., long. 9° 11′ E. (Map: Italy, B 2). The climate is rather changeable and trying. It is extremely hot in summer and quite cold in winter, the winds from the frozen Alps sweeping across the Lombardy plain. The thermometer at times drops below zero. The mean annual temperature is 55.4° F.; rainfall, 39.37 inches.

Milan is a fairly symmetrical polygon in shape, the circuit of its customs district being now nearly 20 miles. Its focus is the splendid Piazza del Duomo (Cathedral Square), from which broad avenues and electric railways radiate in all directions. These radials are connected by an inner circle of modernized streets just outside the canal that marks the location of the ancient moat and of the inner and most ancient city. An additional connection is furnished by a splendid boulevard and by a belt electric railway 7 miles long beyond the sixteenth-century walls that are pierced by a dozen gates and are now planted with trees and used as a promenade, commanding the view of the suburbs. The most magnificent of the radials is the modern Via Dante, constructed in 1888, leading from the handsome Piazza de' Mercanti to the spacious Foro Bonaparte, and thence to the New Park, which was formerly a part of a national drill ground. This park is paved with wooden blocks on a concrete foundation, and on each side, next to the front foundation walls of the houses, has large subways containing water and gas pipes, electric wires, etc. It is beautified by a large pond and spacious promenades, and is faced by the Castello Sforzesco, and also by the Anfiteatro dell' Arena, which was constructed by Napoleon I for races and is capable of seating 30,000 persons. The park is lighted by electricity. Adorning the northeastern section of the city are the splendid Giardini Pubblici, surpassed by few gardens on the Continent. The Corso Vittorio Emanuele is one of the most elegant shopping streets in Italy and the centre of traffic in Milan. The Galleria Vittorio Emanuele, connecting the Piazza del Duomo with the Piazza della Scala, is a splendid glass-covered arcade, with shops, designed by one of Milan's distinguished architects, Mengoni. It is in the form of a Latin cross, with a cupola 160 feet in height.

Architecture is superbly represented in Milan, nearly all styles being displayed in rare examples. Bramante dwelt here many years and left his genius impressed on more than one fine monument. The city is particularly famous for fine churches. Of these the principal is the world-renowned Gothic cathedral, the Duomo of

Milan, one of the finest of ecclesiastical structures, ranking with St. Peter's at Rome and the cathedral of Santa Maria del Fiore at Florence. The vast church has an exterior of white Carrara marble, which is adorned by 98 pinnacles and with more than 4000 statues, besides a variety of carvings of unsurpassable beauty. In form it is a Latin cross, with a length of 486 and a breadth of 287 feet, and covers an area of 14,000 square yards. The height of the tower is 356 feet. The great windows of the choir, said to be the largest in the world, are of stained glass of 1844. Its foundation was laid in 1386 by Gian Galeazzo Visconti, and during its erection many of the greatest European architects contributed designs for its embellishment. Within it Napoleon was crowned King of Italy in 1805. The baroque façade, completed in 1805 after designs by Tibaldi, has been considered out of harmony with the Gothic style of the other portions of the structure, and the inharmonious features began to be removed in 1900, to be replaced by features in keeping with the general style of the structure. At the front of the cathedral is a colossal bronze statue of Victor Emmanuel II. The view of the Alps, Lombardy, and the city from the top of the cathedral is celebrated. The quaint mediæval church of Sant' Ambrogio, erected on the site of a church founded by St. Ambrose in the fourth century, possesses inscriptions, sarcophagi, and monuments full of antiquarian interest, and is historic as the place where St. Ambrose baptized St. Augustine and where the German emperors were crowned kings of Italy. There are also the Dominican church of Santa Maria delle Grazie, which contains in its refectory the now almost obliterated picture of the "Last Supper" by Leonardo da Vinci; the church of San Carlo Borromeo (1847); and San Nazaro, which possesses a masterful fresco by Lanino, and also San Sebastiano, once a Roman temple. The church of San Satiro has a beautiful sacristy—a creation of Bramante. The mural paintings of Luini in the church of San Giorgio al Palazzo are visited by all art lovers. San Lorenzo is an important church, and is in addition the oldest one in the city, tracing its history back to Roman times.

Of the secular buildings of Milan the most noteworthy is the magnificent Brera Palace, formerly a Jesuit college and now used for the fine arts, with the official name of Palace of Arts and Sciences. (For illustration, see LOMBARDY, RENAISSANCE ARCHITECTURE OF.) Within its vast precincts this unique institution includes an academy of art, a choice gallery of paintings of the Bolognese and Lombard schools, a fine collection of casts for modeling purposes, a splendid national library containing about 300,000 volumes and pamphlets, and a rare collection of coins numbering 60,000, with many rare manuscripts and antiquities. It has also attached to it an observatory and a botanical garden. The masterpieces of painting here include Raphael's far-famed "Sposalizio," Mantegna's "Pietà," and Bellini's "St. Mark." The Brera has been greatly enlarged latterly, and many pictures of high rank have been added to its collection. One of the features of the national library is a room devoted to the editions and autograph writings of Manzoni. Another large library is the Ambrosian (q.v.). The Borromeo Palace also has a meritorious collection of paintings. The Museo Poldi-Pezzoli offers a fine collection of paintings, weapons, furniture, porcelain, etc. The Museo Civico is worthy of mention for its superb ornithological collection. There is also a permanent art exposition, and Milan now has good scientific collections.

The Palazzo Reale and the archiepiscopal palace are old and have some attractive features. The fine and elaborate Castello di Porta Giovia dates from 1368 and is the castle of Milan, being associated with the city's governmental and historic career. Among the noteworthy new and attractive secular buildings are the Exchange, finished in 1901, the prefecture, and Palace of Justice. Notable features in the city also are the Court of the Marino Palace, the Corinthian Colonnade, the finest relic of Roman times in Milan, and the well-known triumphal arch begun by Napoleon I. Other conspicuous public monuments are the statues of Victor Emmanuel II and of Cavour, Canova's notable statue of Napoleon I, the huge equestrian statue of Garibaldi, an equestrian statue of Napoleon III in commemoration of Magenta, the monument to Leonardo by Magni, the statues of Cardinal Borromeo and Parini, and the monument to Manzoni. The Cimitero Monumentale, with its decorative tombs and its elaborate cremation temple, is visited by all tourists. Milan is famous for its vast Scala Theatre, which was built in 1178 for operas and ballets. It accommodates 3600 persons and is the largest theatre in Europe after the San Carlo at Naples. Milan is the centre for music in Italy. The famous Conservatory of Music is established in the buildings of an ancient monastery.

Milan has an Academy of Science and Literature, a college for girls, and medical, high, and normal schools. The fine polytechnic, dating from 1865, a commercial academy, an agricultural school, a royal astronomical observatory, and an Academia di Belle Arti are other educational institutions. There are also a municipal zoölogical collection, botanical gardens, and theatres. The government of the city is highly efficient and enormous sums have been expended on public improvements. The system of sewers, about 50 miles in length, empties into the swift covered-over Seveso, whence the sewage passes to the Adriatic by way of the Po. The city water for domestic purposes comes principally from large artesian wells, about 150 feet in depth, and for industrial purposes from the canals. The different philanthropic organizations under the control of the Board of Charities have property valued at over $53,000,000 and a yearly income of $1,600,000. The municipal schools are well organized, with 80 buildings and 50,000 pupils, in addition to which are evening schools attended by over 10,000 older pupils. The Maggiore hospital is one of the largest in the world, accommodating 4000 patients. It dates from 1456. There are deaf-and-dumb institutions and institutions for surgical operations and for ailments of the eyes. Milan has also public dormitories, soup kitchens, etc. The Milan poor suffer greatly from overcrowding. An official investigation showed that 38,000 families were living in one room each and that 333,000 persons, or 70 per cent of the population, were living in 172,417 rooms. Thousands of these rooms had no light, except through the entrance door. In 1905 the citizens voted for municipal construction of houses for the working people, providing for an expenditure of $1,000,000 for the erection of 48 tenement houses to

MILAN
THE CATHEDRAL

contain 500 apartments of one, two, and three rooms each. The Humanitarian Society also appropriated $400,000 for the building of model tenements.

Milan is the leading financial city of Italy and possesses vast wealth. It markets large quantities of grain, cheese, butter, eggs, and poultry, and its manufactures include silk, leather, and woolen goods, stationary engines, locomotives, railway machinery, steam boilers, motors, automobiles, carriages, furniture, glass and earthenware, and chemical products. Cotton weaving and dyeing are also an important industry. A royal mint and a royal tobacco factory are situated here, and there is a corn exchange. It is the centre also of the Italian book trade. Not only are its industries by far the most important in Italy, but its commerce is very extensive. The Grand Canal connects the navigable Olona with Lake Maggiore and the Ticino. The city is also in canal communication with the Po, and with Lake Como through the Adda. It is an important centre of the national railway system. Milan is connected by street railways with the neighboring towns of Lombardy. The local system of electric street railways is excellent. In the last 20 years of the nineteenth century Milan grew more rapidly than any other Italian city. Pop., 1810, 124,000; 1860, 191,000; 1881, 321,839; 1901, 491,460; 1911, 599,200.

History. Livy (v, 34) declares that Milan, the ancient Mediolanum, or Mediolanium, was founded in the time of Tarquinius Priscus by Gauls who had come over the Alps. The ancient name is regarded as Celtic. Milan appears first definitely in history in 222 B.C., when it was taken by the consuls Cn. Scipio and Marcus Marcellus from the Gauls. Later, the town sided with Hannibal; its final and complete submission to Rome dates from 196 B.C. Its inhabitants became Roman citizens in 49 B.C.; in the second century A.D. it was colonized from Rome. Since roads ran from the city in all directions its trade rapidly increased. It rose to great prominence at the close of the third century A.D., when Diocletian made it the capital of Italy. Thereafter Milan was frequently a favorite Imperial residence. It was from Milan that Constantine issued in 313 the famous edict by which Christianity was recognized. Milan became the seat of a bishop, and from 374 to 397 this office was held by the celebrated Ambrose (q.v.). He established a ritual which in some points varied considerably from the Roman, and for a time Milan was the religious metropolis of northern Italy and almost entirely independent of Rome. This first era of prosperity was destroyed by the barbarian invasions by Attila (q.v.) in 452, by the Heruli under Odoacer in 476, and by the Goths under Theodoric in 493. In 539 the city was laid waste by the Goths so completely that but few remains of the city of Roman times have been found; these include a theatre, much below the present level of the ground. Many inscriptions, however, showing clearly the Celtic character of the population have been found; for these see the *Corpus Inscriptionum Latinarum,* vol. v. Only in the tenth century did Milan begin to recover.

During the greater part of the Middle Ages the population of Milan was divided into great nobles (*capitanei*), petty knights (*valvassores*), and the general populace. For a long time the history of the city turns upon conflicts between these various classes. In 1036 the Archbishop Aribert sought to make himself independent of all ecclesiastical and temporal control and for this purpose united with the *capitanei.* He was, however, opposed by the Emperor Conrad II, who was aided by the *valvassores.* The Emperor in 1037 captured and imprisoned Aribert, but he escaped after two months, and the death of Conrad in 1039 put an end for a time to the conflict. But a long-continued revolt against Aribert resulted in the people's obtaining a share in the government. Henry III (1039–56) ruled the whole Empire (Italy included) with a firm hand, but during his reign the forces developed which resulted in the great conflict of the *Pataria* after his death. According to the Ambrosian rules priests were permitted to marry, but Hildebrand (later Pope Gregory VII) attempted to establish sacerdotal celibacy and also sought to connect the church of Milan more closely with that of Rome. He was aided in this attempt by the lower classes of the populace, who were known as *patarini,* i.e., ragamuffins, and were in reality infected with the Manichean heresy. Opposed to this whole movement were the Archbishop and his party, supported by the Emperor, Henry IV (1056–1106), who was also at war with the papacy. The conflict was violent, but terminated with a compromise, by which marriage of priests was forbidden for the future, but those who were married were allowed to retain their wives. The independent position of the archbishops, however, was gone forever, and the way was clear for the establishment of a republican commune, especially as a very powerful artisan class had gradually developed.

By the end of the eleventh century Milan was practically free from external government and was ruled by consuls elected by the three orders; it rapidly acquired a hegemony over the other Lombard cities. When, however, Frederick Barbarossa became Emperor he proceeded to reëstablish the old Imperial power in Italy, and in 1153 began with Milan. Twice the city was compelled to submit, in 1158 and 1162, and the last time it was razed to the ground. The cities of northern Italy, which at first had been glad to witness the destruction of a rival, now, however, saw their own danger and hastened to the assistance of Milan under the leadership of Pope Alexander III. The Lombard League was formed against the Emperor, and in 1176 Frederick was defeated at Legnano, and in 1183 by the Peace of Constance recognized the independence of Milan and the other cities of Lombardy. After these foreign dangers were averted intestine strife again broke out between the various factions—the plebians, who had united in the *Credenza di Sant' Ambrogio;* the merchants; the lesser nobles, or *motta;* the great nobles, or *Societá dei Gagliardi.* Wearied by these continuous quarrels, the citizens began to call in foreigners to rule and mediate, thus giving rise to the office of the *podestà.* In 1226 the Lombard League was renewed to prevent the aggressions of Frederick II, who was finally defeated in 1237 at the battle of Cortenuova.

In the thirteenth century Milan gradually lost its republican liberties. In 1259 the Guelph leader Martino della Torre headed the citizens in a struggle against the Ghibelline nobles and temporarily assumed the lordship of the city. But in 1277 a revolution was effected by the Ghibellines under the Archbishop Otto Visconti, who in turn became the ruler of the city, and at

his death in 1295 the power passed to his nephew Matteo Visconti, who had already been appointed Imperial vicar of Lombardy. From that time the Visconti (q.v.) ruled Milan almost continuously until 1447. Under their supremacy was not only Milan, but the whole of Lombardy; the arts were fostered and prosperity was general. In 1395 the Emperor Wenceslas granted Gian Galeazzo Visconti the title of Duke of Milan. The last of the Visconti, Filippo Maria (1412–47), after a short-lived republic, was succeeded in 1450 by his son-in-law, the celebrated *condottiere* Francesco Sforza (q.v.). The Sforzas were the typical princes of the Renaissance, patrons of art and learning, but at the same time guilty of the greatest cruelties. Milan became involved in the many Italian wars of the period, and finally Lodovico Sforza called in Charles VIII of France, who entered Italy in 1494. From this time on the history of Milan as such has little interest. Louis XII of France, as the descendant of the Visconti, claimed Milan, and the city and duchy for a while changed hands repeatedly between the French and the Sforzas, the latter being supported by Spain. In 1535 the last of the male line of the Sforzas died and Milan became a Spanish possession. In 1713 the Peace of Utrecht, which ended the War of the Spanish Succession, gave Lombardy to Austria. In 1797 Milan became the capital of the Cisalpine Republic, founded by Napoleon, and in 1805 the capital of the Napoleonic Kingdom of Italy. The Congress of Vienna in 1815 gave Lombardy back to Austria, and Milan shared with the rest of the Hapsburg possessions the oppressions of the Metternich régime. On March 18, 1848, the inhabitants rose in insurrection, and on March 23 General Radetzky was compelled to evacuate the city, which was occupied by the Sardinian forces. On August 6, however, Radetzky reëntered Milan. The riots of March, 1849, and Feb. 6, 1853, were vigorously suppressed by the Austrian commanders. In 1859, after the battle of Magenta, the Austrians evacuated the city, which was handed over to Napoleon, who surrendered it to Sardinia with the rest of Lombardy. In May, 1898, it was the scene of serious bread riots.

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MILAN, mĭ′lan. A city and the county seat of Sullivan Co., Mo., 112 miles by rail northeast of Kansas City, on the Quincy, Omaha, and Kansas City and the Chicago, Burlington, and Quincy railroads (Map: Missouri, C 1). It is in a farming and stock-raising region, which has some mineral deposits, particularly of coal. The principal industrial establishments are the coal mines and the shops of the Quincy, Omaha, and Kansas City Railroad, Milan being a division point on that road. The water works and electric-light plant are owned by the city. Pop., 1900, 1757; 1910, 2191.

MILAN DECREES. See CONTINENTAL SYSTEM.

MILANESI, mē-lä-nā′zē, GAETANO (1813–95). An Italian art historian, born at Siena. He studied law in his native city; was employed in a public library; and in 1856 became a member of the Accademia della Crusca. In 1858 he was made assistant keeper of the Tuscan archives at Florence; later took charge of the Medici archives; and in 1889 was appointed director of archives. He retired in 1892. Besides preparing an important edition of Giorgio Vasari's *Vite de' più eccellenti pittori, scultori, ed architetti* (9 vols., 1878–85), and *Les correspondants de Michel Ange*, only 1 vol. of which ("Sebastiano del Piombo," 1890) appeared, Milanesi published: *Il diario inedito di Alessandro Sozzini* (1842); *Documenti per la storia dell' arte senese* (3 vols., 1854–56); *Discorsi sulla storia civile ed artistica di Siena* (1862).

MILANÉS Y FUENTES, mē′lä-nās′ ē fwān′-tās, JOSÉ JACINTO (1814–63). A Cuban poet, born at Matanzas. His first verses appeared in the *Aguinaldo Habañero* (1837) and were favorably received. From this time his work was well known. His early life had been one of poverty and hardship, but afterward he obtained a satisfactory position and was able to travel abroad in 1848. He had been the victim of a mental disease for some time, and during the last years of his life was quite insane. The poetry of Milanés is contemplative and melancholy and, like that of his fellow poets Heredia and Plácida, saddened by the thought of his country's wrongs. Editions of his poems were published at Havana (1846) and New York (1865), the latter with biography and criticism by Federico Milanés.

MILAN OBRENOVITCH (mē′lăn ō-brĕn′ō-vĭch) **IV** (i.e., fourth in the Obrenovitch (q.v.) family) (1854–1901). Prince of Servia from 1868 to 1882 and King from 1882 to 1889. He was born Aug. 22, 1854, at Manassee, Rumania, and was educated at Paris. The assassination of Prince Michael III in 1868 caused his recall to Servia, where he was proclaimed Prince. A council of regency administered the government till he was 18. The revolt of Servia against the Ottoman power, its alliance with Russia in the Russo-Turkish War (q.v.), and its resulting independence and recognition as a kingdom (1882) made his reign memorable. In 1875 he married Natalie Ketchko, the daughter of a Russian colonel, and his quarrels with her and his personal vices deprived him of all prestige. In 1888 he was illegally divorced, and on March 6, 1889, he abdicated in favor of his son Alexander I (q.v.). He became reconciled to Natalie in 1893 and died at Vienna, Feb. 11, 1901. See SERVIA.

MILÁ Y FONTANALS, mē-lä′ ē fōn′tä-näls′, MANUEL (1818–84). A Spanish historian of literature, born at Villafranca del Panadés. He was appointed professor in the University of Barcelona in 1845. He did not obtain wide celebrity until he was appointed president of the Floral Games at Barcelona in 1859. The influence of his philosophical studies is apparent even in so early a work as his *Arte poética* (1848). This was followed by the *Romancerillo*

catalán (1848), a collection of the lyrics of his native region, and by the *Elementos de literatura* and the *Teoría literaria*, which apply philosophical methods to the study of literature. His *Observaciones sobre la poesía popular* appeared in 1853. His noblest productions are *Los trovadores en España* (1861) and *La poesía heróico-popular* (1874). Consult: Rubió y Ors, *Noticia de la vida y escritos de D. Manuel Milá y Fontanals* (Barcelona, 1887), and the edition of his *Obras completas* (id., 1885), prepared by M. Menéndez y Pelayo, who never wearied of praising Milá y Fontanals as a great scholar and a great teacher.

MILAZZO, mē-lät'sô, or **MELAZZO**. A city in the Province of Messina, Sicily, 16 miles by rail west of the city of Messina, at the base of a narrow peninsula, 4 miles long (Map: Italy, E 5). It has a very large and safe harbor which serves as a refuge for vessels trying to make the north entrance of the Strait of Messina. Its thirteenth-century castle is now used as a jail. It has a city hospital, a technical school, a city library of 10,000 volumes, and a municipal theatre. It markets wine, fish, cattle, fruit, and sulphur and has a considerable foreign trade and extensive tunny fisheries. Pop. (commune), 1910, 16,422; 1911, 16,569. Milazzo is on the site of the ancient Mylæ, founded prior to the eighth century B.C. by colonists from Messina. A great naval victory was won here over the Carthaginians in 260 B.C. by G. Duilius. The crowning point of Garibaldi's victorious Sicilian campaign was his defeat of the Neapolitans here, July 20, 1860.

MIL'BANK, JOSEPH (1848–1914). An American philanthropist, born in New York City. Between 1896 and 1903, together with his sister, Mrs. Elizabeth Milbank Anderson, he gave $3,000,000 to Teachers and Barnard colleges, Columbia University. Connected with the former is Milbank Memorial Chapel and with the latter Milbank Hall. In 1901 he established the Milbank Baths at a cost of $150,000, and in 1905 he gave $200,000 to found the Jersey City People's Palace, a clubhouse for the people under the control of the First Congregational Church of Jersey City. With his sister he gave $650,000 to establish a Social Welfare Bureau and $500,000 to the Children's Aid Society. In all they gave nearly $5,000,000.

MIL'BURN, WILLIAM HENRY (1823–1903). An American clergyman. He was born in Philadelphia and educated at Illinois College. He entirely lost the sight of one eye and partially that of the other while he was a boy, and finally became wholly blind. He became a minister of the Methodist Episcopal church in 1843 and was appointed to circuits in Illinois and the South, with several appointments at Montgomery, Ala., in 1848, and Mobile in 1850, and for two years after 1852 preached in an independent church. He was ordained a deacon in the Protestant Episcopal church in 1865 and priest in 1866, but returned to the Methodist Episcopal church in 1871. He was elected chaplain of Congress in 1845 and 1853, chaplain of the House of Representatives in 1885 and in succeeding terms, and was chaplain of the Senate from 1893 to 1902. He published *Rifle, Axe, and Saddlebags, Symbols of Western Character and Civilization* (1856); *Ten Years of Preacher Life, Chapters from an Autobiography* (1858); *Pioneers, Preachers, and People of the Mississippi Valley* (1860), comprising lectures given at the Lowell Institute in 1854; *The Lance, Cross, and Canoe in the Valley of the Mississippi* (1893).

MIL'COM. The national god of Ammon, mentioned in 1 Kings xi. 5, 33; 2 Kings xxiii. 13; Jer. xlix. 13; probably 2 Sam. xii. 30; and also 1 Kings xi. 7, where the true reading seems to be supplied by the Greek version. The name is clearly derived from *melek*, 'king,' and the final *m* probably represents the old determinative mimmation. If Milcom was the original reading in 2 Sam. xii. 30, it would seem to indicate that the Ammonitish god was represented by an idol in human form. There is no evidence that this deity was also called Molech (q.v.) or that children were sacrificed to Milcom, though it is not in itself improbable that this rite was practiced by the Ammonites on extraordinary occasions, as it certainly was by their kinsmen, the Moabites. (See MOAB.) Solomon erected a sanctuary to Milcom on the Mount of Olives, possibly on the site of the present Jebel batn el hawa, which Josiah afterward defiled. (2 Kings xxiii. 13.)

MILDER-HAUPTMANN, mĕl'dĕr-houpt'-mân, ANNA PAULINE (1785–1838). A German opera singer, born at Constantinople, the daughter of an Austrian attaché. She studied under Tomascelli and Salieri in Vienna; made her first appearance in that city in 1803, but was at the height of her power in Berlin (1815–29). She toured Russia, Sweden, and Denmark at the close of her stage career. She was one of the earliest examples of a great vocalist possessed at the same time of extraordinary histrionic ability. For this reason Beethoven chose her to create the rôle of Leonora in his *Fidelio*.

MIL'DEW (AS. *meledēaw*, honeydew, from **mele*, Goth. *miliþ*, Lat. *mel*, Gk. *μέλι*, *meli*, honey + *dēaw*, dew). A somewhat indefinite term used to designate a number of plant diseases that are caused by fungus parasites, as well as spots caused by microscopic fungi on cloth, paper, leather, glassware, etc. In England the term as applied to plant diseases has a much wider significance than in the United States. It is there made to include what are known in America as cereal rusts and smuts, as well as many other diseases not recognized as due to the mildews proper. In the United States the mildews are divided into two classes: the true or powdery mildews, due to fungi belonging to the family Erysiphaceæ; and the false or downy mildews caused by fungi of the family Peronosporaceæ. The powdery mildews attack the leaves, stems, flowers, and fruits of many of the most valued plants. For the most part they form superficial flourlike patches of white upon their host plants. The fungus most commonly develops over the surface of the leaves and sends minute suckers into the epidermis, by which they absorb nourishment from the host. They cause distorted and stunted growth and often the death of the part of the plant affected. During the summer the fungus sends up numerous branches, which bear myriads of one-celled spores called conidia, by which the mildew is rapidly spread to other plants. Later in the season thick-walled resting spores are produced, by which the fungus is carried through the winter. These spores have appendages of various kinds, by which they retain their attachment to the leaves, and in the spring they develop a new generation of thin-walled spores for the spread of the disease. There are about 150

described species of powdery mildews, and there are very few plants that are not subject to attack from some of them. Among the common ones injurious to economic plants are the apple, pear, and cherry mildew (*Podosphæra oxycanthæ*), rose mildew (*Sphærotheca pannosa*), hop mildew (*Sphærotheca castagnei*), grape mildew (*Uncinula spiralis*), mildew of wheat and other grasses (*Erysiphe graminis*), gooseberry mildew (*Sphærotheca mors-uvæ*), cucumber mildew (*Erysiphe cichoracearum*), which also attacks verbenas, sunflowers, asters, and other plants, pea mildew (*Erysiphe polygoni*), etc. Downy mildews are internal parasites which grow through the tissues of the plants that bear them and only appear outside to shed their microscopic spores. The branches of the fungus bearing these spores are often so abundant as to give a peculiar downy or frosty appearance to the leaf or other part of the plant infested. The spores (conidia) are one-celled, thin-walled, and readily blown about by the wind. Falling upon a new leaf or plant, if the moisture conditions are favorable, they quickly germinate and set up a new infection. In this way they spread with great rapidity and often produce epidemic outbreaks of disease. The resting spores are formed within the tissues of the host and are thus carried over from season to season. They are liberated by the decay of the tissues surrounding them, and from these a new generation is derived. Among the downy mildews are some of the most serious plant parasites. The more common ones are the potato rot or mildew (*Phytophthora infestans*), the grape downy mildew (*Plasmopara viticola*), lima-bean mildew (*Phytophthora phaseoli*), lettuce mildew (*Bremia lactucæ*), onion mildew (*Peronospora schleideni*), beet mildew (*Peronospora schachtii*), cucumber and melon downy mildew (*Plasmopara cubensis*), downy mildew of radishes and other cruciferous plants (*Cystopus candidus*), etc. Most of these mildews are more fully described under the diseases of their respective host plants. The problem of combating them has been a subject of much experimentation in America and in Europe. It has been found that many of the powdery mildews can be held in check and often serious loss prevented by dusting the plants with sulphur, or, if in a house or frame where it can be done, exposing them for a few moments to the fumes of boiling, but not burning, sulphur. Spraying thoroughly and repeatedly with Bordeaux mixture, ammoniacal copper carbonate solution, or other standard fungicide (q.v.) will prevent the serious attack of both classes of mildews. Success in these preventive treatments depends upon thoroughness. See DISEASES OF PLANTS; FUNGI, ECONOMIC; Plate of FUNGI, TYPES OF; PERONOSPORACEÆ; PHYCOMYCETES.

MILE. A measure of length in common use in Great Britain and the United States and their colonies. The name was also in use in the continent of Europe to designate generally a much larger measure of length, although the official measure is now generally the kilometer (.6213 mile). The mile is derived from the Roman *milliare*, which contained 1000 paces (*mille passuum*) of 5 Roman feet each, the pace (*passus*) being the length of the double step (*gradus*) made by one foot from the time it was taken off the ground until it was put down again. The Roman foot being between 11.62 and 11.65 English inches, the Roman mile was thus less than the present English mile by from 142 to 144 yards. The mile is found referred to in a law of King Athelstane (925–940 A.D.) and as a unit of length has not altered from before the Norman Conquest to the present time. On the continent of Europe previous to the general adoption of the metric system, the length of the modern mile in different countries exhibited a remarkable diversity not satisfactorily accounted for. In some cases, such as the Prussian mile, which was 4.68 statute miles, and the Swedish mile, equal to 6.648 statute miles, the length was far in excess of current understanding of the measure. Such miles, however, have long been obsolete and are only interesting to the student of metrology or the surveyor working on old maps. Before the time of Elizabeth scientific writers made use of a mile of 5000 English feet, from the notion that this was the Roman mile, forgetting the difference in value between the English and the Roman foot. The present English statute mile was incidentally defined by an act passed in the thirty-fifth year of the reign of Elizabeth to be "8 furlongs of 40 perches of 16½ feet each"—i.e., 1760 yards of 3 feet each—and it has since retained this value. The *geographic*, *nautical*, or *sea* mile is variously defined as (*a*) the length of a minute of latitude at any point, (*b*) the mean length of a minute of latitude (6082.66 feet), and (*c*) the length of a minute of longitude on the equator (6087.15 feet). The United States Coast Survey has adopted as the standard geographic mile the length of a minute of latitude of a sphere having the same surface as the earth. This gives a length of 6080.27 feet. The British Admiralty mile is 6080 feet. The United States nautical, sea, or geographical mile as given by the National Bureau of Standards (Circular 47, 1914) is 6080.20 feet. As the United States statute mile is 5280 feet, a nautical mile is 1.151553 statute miles, or 1853.249 meters. For ordinary purposes of navigation the nautical mile is assumed to be equal to a minute of latitude in the region navigated, the error being inappreciable in the calculations. See WEIGHTS AND MEASURES; METRIC SYSTEM; and the various authorities referred to thereunder.

MILE'AGE. Compensation reckoned at so much per mile in lieu of traveling expenses usually allowed public officers who are compelled to journey to the seat of government in order to discharge their official duties. It is usually reckoned according to the shortest route by which the officer is able to travel. American army officers traveling under orders are allowed seven cents a mile; Senators and Congressmen are allowed 20 cents a mile when traveling to the seat of government at the opening of a session and to their homes at its close. An abuse of the system is constructive mileage, allowed for distances not actually traveled, as when the time between the close of one session and the opening of another is too brief to admit of a return of Senators and Congressmen to their homes.

MILELLI, mē-lĕl'lē, DOMENICO (1841–1905). An Italian poet, born at Catanzaro in Calabria. His poetry shows much imagination, but little sustained force. His *Odi pagane* (1879) were much criticized, not only for their pagan spirit, but on account of attacks on Manzoni. Other works are: *In giovinezza* (1879); *Gioconda* (1874); *Hiemalia* (1874); *Povertà* (1879); *Discerpta* (1881); *Il rapimento di Elena*

(1882); *Canzoniere* (1884); *Verde antico* (1885); and *Miscellanea* (1886), a volume of essays. Consult Patari, *L'opera poetica di D. Milelli* (Cosenza, 1912).

MILES, Nelson Appleton (1839–). An American soldier, born at Westminster, Mass., Aug. 8, 1839. He received an academic education and between 1856 and 1861 was engaged in business in Boston. During the Civil War he rose from the rank of first lieutenant of the Twenty-Second Massachusetts Infantry to be major general of volunteers (Oct. 21, 1865). "For highly meritorious and distinguished conduct throughout the campaign and particularly for gallantry and valuable services at the battle of Reams Station, Va.," he was brevetted major general of volunteers (Aug. 25, 1864), and March 2, 1867, he received brevets of brigadier general and major general for services at Chancellorsville and Spottsylvania respectively. He had fought also at Antietam, Fredericksburg, and in the campaign before Richmond (1864). His conduct at Chancellorsville, where he had been seriously wounded, brought him the congressional medal of honor in 1892. After the war General Miles became an officer in the United States army, being appointed colonel of the Fortieth Infantry in July, 1866, and rising to be brigadier general (1880), major general (1890), and lieutenant general (in pursuance of an Act of Congress of June 6, 1900). Upon the retirement of General Schofield in 1895 he became senior officer commanding the army. During a period of about 15 years Miles was known chiefly for his distinguished services against the Indians in the West. In 1875 he defeated the Cheyenne, Kiowa, and Comanche tribes, and in 1876 the Sioux and Nez Percés in Montana. After his campaign (1886) against the Apaches, in which he compelled their chiefs, Geronimo and Natchez, to surrender, he received the thanks of the legislatures of Kansas, Montana, New Mexico, and Arizona. In 1890–91 he suppressed Indian outbreaks in South Dakota. During the railroad strike troubles of 1894 in Chicago he commanded the Federal troops ordered by President Cleveland to prevent interference with the carriage of the mails. Later he represented the United States army at the seat of the Turco-Grecian War, and on the occasion of Queen Victoria's Diamond Jubilee (1897). During the war of 1898 against Spain he directed in person the occupation of Porto Rico. Within two weeks the entire western part of the island was cleared, the total loss of Americans being only four killed and forty wounded. In 1902–03 General Miles made a tour of inspection in the Philippine Islands. He was retired Aug. 8, 1903. The degree of LL.D. was conferred on him by Harvard, Brown, and Colgate universities. He published *Personal Recollections, or from New England to the Golden Gate* (1897); *Military Europe* (1898); *Observations Abroad* (1899); *Serving the Republic* (1911).

MILES CITY. A city and the county seat of Custer Co., Mont., 114 miles by rail northeast of Billings, on the Chicago, Milwaukee, and St. Paul and the Northern Pacific railroads (Map: Montana, L 3). Farming, cattle and sheep raising, and the manufacture of saddlery are the chief industries. It is a jobbing centre and shipping point for considerable quantities of wool, and a large market for range horses. In 1914, 28,442 horses were sold here at auction. The water works and electric-light plant are owned by the city. Miles City contains a county hospital, a beautiful park on the Tongue River, an Ursuline convent, a well-equipped high school, a State industrial school, and a public library. Pop., 1900, 1938; 1910, 4697; 1915 (state census), 7621.

MILES GLORIOSUS, mī'lēz glō'rĭ-ō'sŭs (Lat., braggart soldier). A comedy by Plautus.

MILE'SIANS. The original Gaelic colonists of Ireland, so called, according to the bardic accounts, from the three sons of Mil (Latinized Milesius), who, coming in force from the opposite coast of Spain or Gaul, landed on the southern end of the island and defeated the preceding colonists and conquerors, the Tuatha De Danann, in two great battles, thus making themselves masters of the country. The date is indefinitely placed some centuries before the Christian era. This was the last of the traditional prehistoric colonizations of Ireland, the dominant Milesians fusing with the Tuatha De Danann (q.v.) and Firbolgs (q.v.) to form the Irish race as we find it at the dawn of history. The native kings, chieftains, and prominent families up to the period of the Norman Conquest all claimed direct descent from Milesian ancestry.

MILESIAN TALES (Μιλησιακά, *Milēsiaka*). The name given to a class of short, indecent anecdotes in vogue at Miletus and through Asia Minor in the first century B.C. The compilation of six books of these stories was ascribed to a certain Aristides of Miletus. Fragments of these works, from the translation by Sisenna (q.v.), are printed in Bücheler's small edition of Petronius (5th ed., Berlin, 1882). Consult H. T. Peck, *Trimalchio's Dinner*, pp. 20–32, 40–44 of the "Introduction" (New York, 1898), and L. C. Purser, *The Story of Cupid and Psyche as Related by Apuleius*, xix–xxi, pp. 125–127 (London, 1910).

MILET DE MUREAU, mē'lā' de mu'rō', Louis Marie Antoine Destouff, Baron (1756–1825). A French soldier and politician, born at Toulon. He entered the army and was made a captain. As a member of the States-General, in 1789, he voted with the Right; afterward he commanded the artillery in the army of occupation in Italy. He was made a brigadier general in 1796; was War Minister for a few months in 1799; was created Baron by Napoleon in 1809; served as a prefect of the Department of Corrèze in 1802–10 and director of the general War Department in 1814, but retired two years afterward. He edited the Pérouse journals, which were published under the title *Voyage de La Pérouse autour du monde 1785–88* (1797; 2d ed., 1798).

MILE'TUS (Lat., from Gk. Μίλητος, *Milētos*). Anciently the greatest city of Ionia (q.v.) in Asia Minor (Map: Greece, Ancient, E 3). It was situated on the Latmic Gulf, at the mouth of the Mæander, in a rich valley, and was famous for its woolen manufactures and for its extensive trade with the north and the south, and with Phrygia. The site is said to have been occupied by a Carian town when the Ionian colonists, under Neleus, seized the place, massacred the men, and took possession of their wives. Pottery found by Wiegand (see the bibliography below) proves that the city was in touch with the Ægean civilization in the latest Minoan period. (See Archæology, II, *Minoan*, or *Ægean, Period.*) Though the inhabitants prided themselves on their Ionian descent, the names of their tribes show the presence of a foreign element. The

city early came to occupy a commanding position in the Greek commercial world and established many colonies in the north, as Abydos and Lampsacus, on the Hellespont; Cyzicus, on the Propontis; Sinope, Olbia, Istria, Tomi, and Panticapæum, on the Black Sea. Under the tyrant Thrasybulus it offered so resolute a resistance to the Lydian kings that it was at last received into an alliance on equal terms. By 500 B.C. it was one of the first Greek cities, if not actually the first. It took a prominent part in the Ionian revolt (500 B.C.; see IONIA), and after the battle of Lade was besieged by the Persians, and after a long resistance captured and destroyed in 494 B.C. It seems to have revived after the formation of the Athenian League, and near the close of the Peloponnesian War ventured to revolt and join the Spartans (412 B.C.). It also offered some resistance to Alexander, but seems to have declined from that time, though it continued to exist for several centuries. St. Paul spent two or three days there on his last journey to Jerusalem before his imprisonment at Rome, and delivered his farewell address to the elders from Ephesus, who visited him at his request. (Acts xx. 15–xxi. 1.) Another visit, referred to in 1 Tim. iv. 20, is best placed in a period later than that covered by the Book of Acts. In Roman times the city retained commercial importance, especially under Trajan. In time its four harbors were filled up by deposits made by the Mæander; Lade, once an island protecting the harbors, is now a hill several miles inland. Miletus has a distinguished place in the history of Greek literature, having been the birthplace of the philosophers Thales, Anaximander, and Anaximenes, of the historians Cadmus and Hecatæus, and of the poet Timotheus. Aspasia, wife of Pericles, also was born at Miletus. The site of the city itself is a swampy plain, occupied by the little Turkish village of Palatia. Excavations were begun for the Berlin Academy in 1899, by Th. Wiegand, and in spite of great difficulties have determined the course of the ancient walls, some streets, the Bouleuterion and part of the Agora, and other points important for the topography of the city. A theatre, the largest, perhaps, in Asia Minor, with 54 rows of seats, still rising 100 feet or more, has been uncovered; so, too, a stadium. On the southeast a large temple of Apollo Delphinius, with a central court surrounded by a triple colonnade, was found; in this building, the chief temple of the city, public records were kept. A sacred way, bordered by tombs, led to Didymi. (See BRANCHIDÆ.) Reports of the excavations are published in the *Sitzungsberichte der Akademie der Wissenschaft zu Berlin* for 1900 et seq. Consult also the unfinished work of Rayet and Thomas, *Milet et le Golf Latmique* (Paris, 1877 et seq.); Arnold von Salis, "Die Ausgrabungen in Milet und Didyma," in *Neue Jahrbücher für das klassische Altertum*, vol. xxv (Leipzig, 1910); K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., with map and plan, ib., 1914).

MILETUS, EUBULIDES OF. See EUBULIDES OF MILETUS.

MILETUS, HECATÆUS OF. See HECATÆUS OF MILETUS.

MILETUS, HESYCHIUS OF. See HESYCHIUS OF MILETUS.

MILETUS, TIMOTHEUS OF. See TIMOTHEUS OF MILETUS.

MI'LEY, JOHN (1813–95). An American Methodist Episcopal theologian. He was born near Hamilton, Butler Co., Ohio; graduated at Augusta College, Kentucky, in 1838; entered the ministry in the same year; and served churches in Ohio and eastern New York from 1838 to 1873, except during 1848–50, when he was teacher in Wesley Female College, Cincinnati. From 1873 till his death he was professor of systematic theology in Drew Theological Seminary. He was a member of the General Conferences of 1864, 1872, 1876, 1888, and 1892, and of the Centennial Methodist Conference of 1884, where he presented a paper entitled "The Work of the Christmas Conference of 1784." In 1886 he was the fraternal delegate to the General Conference of the Methodist Episcopal church, South. He was the author of a *Treatise on Class Meetings* (1851); *The Atonement in Christ* (1879), which advocates the governmental theory; *Systematic Theology* (1892–94). He was a progressive conservative, holding to the substance of the traditional Methodist theology, but introducing important and some even radical changes of view. He was the brother-in-law of Bishop Randolph S. Foster.

MILFOIL. An herb. See ACHILLEA.

MIL'FORD. A seaport in Pembrokeshire, Wales, on the famous Milford Haven, 6 miles from its entrance and 273 miles west of London by rail (Map: England, A 5). The haven is formed by an estuary running inland for 17 miles to Langwin (easily reached by vessels of 2000 tons), and varies from a mile to two miles in breadth. It is protected from winds by a girdle of hills; its lower reaches are well fortified. The distance of Milford, however, from the Channel, the highway of British commerce, is a serious disadvantage, and its trade is not commensurate with the natural advantages furnished by its excellently protected harbor. The town has passenger and cattle traffic with Irish ports, and an average of 2700 vessels of 575,000 tons' burden enter and clear annually. Area of docks, 60 acres; depth of water over sill (high tide), 34 feet. The proposition to make Milford the eastern terminus of the English transatlantic steamers has been discussed since 1790. It would shorten by several hours the time now necessary for reaching London. It has important and rapidly increasing fish and oyster industries. The United States is represented by a consul. The town owns its water and gas supplies. The haven is frequently mentioned in Shakespeare's *Cymbeline*. Henry VII, when Earl of Richmond, landed here in 1485, on his way to claim the crown. Pop., 1901, 5102; 1911, 6399.

MILFORD. A town in New Haven Co., Conn., 9 miles southwest of New Haven, on Long Island Sound, at the mouth of the Wepowaug River, and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, C 5). It is an attractive summer resort, with fine boating and bathing facilities. Its noteworthy features include the Taylor Library, an interesting Memorial Bridge, erected (1889) on the two hundred and fiftieth anniversary of the town's settlement, a soldiers' monument, and the Broad Street Park of four acres. The leading industries are farming, seed growing, oyster cultivation, wood turning and sawing, and the manufacture of straw hats, gas meters, brass novelties, car furnishings, etc. Pop., 1900, 3783; 1910, 4366; 1920, 10,193.

Milford, called Wepowage by the Indians, was settled in 1639 by a company from New Haven and Wethersfield. In 1644 Milford became one of the six towns which constituted the confederate "Colony of New Haven," and in 1664 it came under the jurisdiction of Connecticut. Robert Treat, an early Colonial Governor, lived in Milford, and here, from 1661 to 1663, the regicides Goffe and Whalley were secreted. Consult "Early Milford," in the *Connecticut Magazine*, vol. v (Hartford, 1899).

MILFORD. A town in Kent and Sussex counties, Del., about 73 miles by rail south of Wilmington on Mispillion River and on the Philadelphia, Baltimore, and Washington Railroad (Map: Delaware, J 3). A steamship line also connects the town with Philadelphia. It is the shipping point for the surrounding agricultural and fruit-growing district and has various industrial interests, including large packing houses and manufactories of dental supplies and lumber products. Milford was founded in 1680 and was incorporated in 1787. The town owns its water works and electric-light plant. Pop., 1900, 2500; 1910, 2603.

MILFORD. A town in Worcester Co., Mass., 18 miles (direct) southeast of Worcester, on the Charles River and on the Boston and Albany and the New York, New Haven, and Hartford railroads (Map: Massachusetts, D 4). It has a fine Federal building, public parks, a splendid system of schools, a public library, and a hospital. The town is the distributing centre for a wide area and is noted as a manufacturing centre, its products including shoes, straw goods, bone cutters, foundry and machine-shop products, looms, rubber goods, etc. There are also extensive quarries of a high grade of granite, which is used in the construction of some of the largest buildings in the country and which is shipped in large quantities. The government is administered by town meetings, which convene at least twice a year. Pop., 1910, 13,055; 1914 (U. S. est.), 13,770; 1920, 13,471. Settled as early as 1669, Milford, with a population of 750, was incorporated as a separate town in 1780, having previously been the East Precinct of Mendon. Consult Ballou, *History of the Town of Milford* (Boston, 1882).

MILFORD. A town in Hillsboro Co., N. H., 11 miles northwest of Nashua, on the Souhegan River and on the Boston and Maine Railroad (Map: New Hampshire, F 8). Milford is one of the largest granite-producing towns in the United States, having 27 firms in that business, and there are also manufactories of furniture, post-office equipment, baskets, celluloid, woolen cloth, towels, ice-cream freezers, and shoes. Ample water power is obtained from the Souhegan. The water works are owned by the municipality. Pop., 1900, 3739; 1910, 3939.

MILHAU, mē'lō'. A town of France. See MILLAU.

MILHAUD, mē'yō', GASTON (1858–). A French philosopher, born at Nîmes. He was at first an assistant professor of mathematics at the University of Montpellier, where he obtained a doctorate in letters in 1894 and became professor of philosophy in the same year. In 1910 he was appointed professor of the history of philosophy at the Sorbonne, Paris. He is author of *Leçons sur les origines de la science grecque* (1893); *Essai sur les conditions et les limites de la certitude logique* (1894; 2d ed., 1898); *Le rationnel* (1898); *Les philosophes-géomètres de la Grèce* (1900); *Le positivisme* (1902); *Le progrès de l'esprit* (1902); *Etudes sur la pensée scientifique chez les Grecs et les modernes* (1906); *Nouvelles études sur l'histoire de la pensée scientifique* (1911).

MIL'IA'RIA (Lat. fem. sing. of *miliarius*, relating to millet, from *milium*, millet). A structural affection of the sweat glands, caused by an obstruction to the sweat secretion and generally accompanied by inflammation. It is classed with the skin diseases.

In *miliaria crystallina*, or *sudamina*, the non-inflammatory form, the lesion consists of minute, pearly vesicles set closely together, but always discrete, generally appearing on the neck, chest, and abdomen, but sometimes in other parts of the body. The vesicles appear rapidly and depart in a few days. Invasions of fresh crops may occur, thus continuing the eruption for weeks. The vesicles are collections of sweat under the superficial layers of the skin.

In *miliaria vesiculosa*, or *rubra*, inflammation occurs in the gland, and the vesicles appear as if raised on a red base. This is the *strophulus*, or *red gum*, of the ancients and is seen principally in children during hot weather and when excessively heavy clothing is worn.

Miliaria papulosa, or *lichen tropicus*, is commonly known as prickly heat. In this variety red, pointed papules are crowded together, with here and there a vesicle or pustule. It is accompanied by excessive sweating and annoying prickling and tingling. It is a tropical disease, of which a milder form is seen in this country.

The treatment of miliaria consists in removing heavy clothing, administering cool baths and saline diuretics, and applying locally soothing and astringent lotions, such as lead water, black wash, dilute vinegar, or powdered camphor mixed with starch or oxide of zinc.

MIL'IA'RIUM AU'REUM (Lat., golden milestone). A gilded column of bronze near the rostra, towards the west end of the Roman Forum. On it were engraved the distances from the city gates of the main stations and cities on the great roads leading out of Rome. It was set up in 29 B.C. by Augustus as a record of the results of a survey of the Roman domain. Portions of an exquisite marble base, supposed to be the base of the Golden Milestone, were discovered on the spot in 1849. Consult R. A. Lanciani, *The Ruins and Excavations of Ancient Rome* (Boston, 1897).

MIL'IARY FEVER. See MILIARIA; SWEATING SICKNESS.

MILIČEVIČ, mē'lē-chĕv'ĭch, MILAN. See MILITCHEVITCH, DJAKOV MILAN.

MILICZ, mē'lĭch, or **MILITSCH,** OF KREMSIER (c.1325–74). A predecessor of John Huss. He was born at Kremsier, Moravia; entered holy orders and was attached to the court of the Emperor Charles IV; became a canon and later Archdeacon. In 1363 he resigned his appointments, giving himself up to preaching, and was very successful. He went to Rome in 1367 to expound his views as to ecclesiastical abuses, but was thrown into prison by the Inquisition, from which he was released by Pope Urban V on his arrival from Avignon in the autumn of that year. He returned to Prague, where he preached daily with greater success than ever till in 1374 he was summoned before the Papal Court at Avignon, upon complaint as to his orthodoxy, preferred by the clergy of Prague. He obeyed, and the complaint, after investiga-

tion, was dismissed. He died in Avignon on June 29, 1374. Consult Palacky, *Die Vorläufer des Hussitenthums* (Prague, 1869), and Lechler, *Johann von Wiclif und die Vorgeschichte der Reformation*, vol. ii (Leipzig, 1873).

MILIN'DA. The Pali form of the name of the Græco-Bactrian King Menander (q.v.). In the literature of the Buddhists his name is important through a book entitled *Milindapañha* or "Questions of Milinda," a work which professes to give an account of a discussion between him and the Buddhist sage Nagasena. It has been translated into English by Davids, *The Questions of King Milinda* (Oxford, 1890–94).

MILIOUKOV, Paul. See Milyukov, Pavel.

MILITARISM. A term employed somewhat loosely to designate a tendency to subordinate civil to military considerations in the policy of the state. In time of peace the civil power is theoretically supreme: the military power is an instrument to be employed in the execution of civil policies. Practically, however, the constitutional position of the army may be so strong as to give it an important, or even paramount share in the determination of both domestic and foreign policy. This is especially likely to be the case where a nation is surrounded by powerful antagonistic nations. The German Empire presents the best modern instance of militarism, but all the great powers of continental Europe manifest in greater or less degree the characteristics of militarism.

The term is still more loosely used to designate an acceptance of the theory of the inevitableness of warfare, and of the policy of military preparedness. Militarism in this broad sense is the antithesis of pacifism in the narrow sense of a movement towards immediate and absolute disarmament. See Imperialism; Industrialism; Peace Movement, *International*.

MILITARY ACADEMY, Royal. An establishment at Woolwich, England, through which must pass all candidates for the Royal Artillery and the Royal Engineers. See Military Education.

MILITARY ACADEMY, United States. The national institution for the theoretical and practical training of cadets for commissions in the United States army. It is situated at West Point, N. Y., on the west bank of the Hudson, 50 miles from its mouth, amid the picturesque peaks of the Highlands. This place has been occupied as a military post continuously since Jan. 20, 1778. (See West Point for Revolutionary history of the locality and description of the modern post buildings, surroundings, etc.) The Academy itself had its origin in a resolution passed by Congress on Oct. 1, 1776, which appointed a committee to prepare a plan for "a military academy of the army," but the earliest proposal for a military school for the United States was that of General Knox (May, 1776). His plans were seconded by Col. Alexander Hamilton and approved by General Washington. On June 20, 1777, it was ordered that a Corps of Invalids organized as "a military school for young gentlemen previous to their being appointed to marching regiments" be instituted; which order was carried into effect almost immediately. General Washington was untiring in his efforts to establish the Academy, and it was at his request in 1781 that the Corps of Invalids was marched from Philadelphia to join the garrison at West Point, where an engineer school, a laboratory, and a library had already been established. Two years later Washington again brought the idea of a military academy before his officers at Newburgh, and made a special reference to it in his message of Dec. 3, 1793. On May 9, 1794, his ideas and aspirations were crystallized in a law approved on that date, whereby was authorized the organization of a Corps of Artillerists and Engineers with two "cadets" to each company, and a school of instruction for them was established at West Point in the same year.

The buildings, used as an engineer school, laboratory, and library respectively before 1781, were in 1796 burned down, and thus for a time the work of the Academy was suspended. Instruction was resumed on Sept. 1, 1801, by order of the Secretary of War, who, on July 20 of that year, issued an order directing that all the cadets of the Corps of Artillerists should report at West Point for instruction. The faculty of the Academy at this time was made up of four army officers and a civilian, who acted as administrators and instructors. The actual creation of the Military Academy as it is known today occurred in 1802, under the authorization of an Act of Congress approved on March 16. West Point was selected for its location, and with a class of 10 cadets present it was formally opened on July 4, 1802. The bill authorized the establishment of a Corps of Engineers to consist of 5 persons, a major, 2 first lieutenants, 2 second lieutenants, and 10 cadets, with the pay of $16 per month. Provision was also made for promotions in the corps, not to exceed 1 colonel, 1 lieutenant, 2 majors, 4 captains, 4 first lieutenants, and 4 second lieutenants; but it was also distinctly ordained that the entire corps should not exceed 20 officers and cadets. The following year an increase of 40 cadets was authorized, and, in 1808, 156 became eligible, but, owing to the lack of provision for them at the Academy, very few of them were enabled to report for instruction.

The Academy passed through many vicissitudes about this time, and in March, 1812, was without a single instructor. Students entered without any mental or physical examination and with little regard to age. The War of 1812, however, called the attention of the government to the pressing needs of the Academy. Only 71 students had been graduated in its first 10 years, and President Madison called the attention of Congress to the necessity of making the Academy a scientific as well as a military college, in consequence of which, on April 29, 1812, the Academy was reorganized upon the principles which underlie its present organization. In 1818 the rules approved by President Monroe went into effect and provided that the assignment of cadets to the different corps in the army and their relative rank must depend upon their general merits, to be determined by a competent board of examiners, and that cadets should not be promoted until after they had received a diploma. Col. Sylvanus Thayer was appointed superintendent of West Point in 1817, and succeeded in making the institution famous among the military schools of the world. In 1815 he was sent by the government to Europe to study military schools, and during the 16 years of his superintendency (1817–33) completely reorganized the curriculum of the United States school. He organized the system of divisions of classes into sections, organized the corps of

cadets into a battalion, and created the position of commandant of cadets. In 1833 he took issue with President Andrew Jackson regarding details of management and resigned his post. In 1838 it was again offered him, together with concessions that gave him almost absolute control, but he declined to accept. From this time on little change has been made in the organization of the Academy other than those natural to the progress of time. Thayer is justly regarded as the Father of the Military Academy; with him began the present era of the Academy's history.

The Civil War (1861–65) brought West Point into considerable prominence throughout the civilized world—so much so that since then its methods have been carefully studied by the experts of nearly every great European country. Every one of the commanding generals on both sides in the Civil War who earned high military honors was a graduate of West Point.

The authorized number of cadets for 1916 is 745, but unless the Law of 1910 making certain increases be reënacted, this number will afterward fall to 571; the number of officers and civilians on duty on Jan. 1, 1915, was 132. The course of instruction is to a large extent mathematical and professional. The curriculum is as follows (September 1–June 4):

First year (fourth class): mathematics, English, history, surveying, drill regulations, gymnasium.

Second year (third class): mathematics, French, drawing, military hygiene, drill regulations, riding, gymnasium.

Third year (second class): natural and experimental philosophy (physics), chemistry, electricity, geology and mineralogy, drawing, drill regulations, Spanish, riding, gymnasium.

Fourth year (first class): civil and military engineering, military, international, and constitutional law, hippology, riding, ordnance and gunnery (with machine-shop practice), Spanish, gymnasium.

The physical training of a cadet is most carefully attended to. Apart from the regular drills and target practice, he learns to swim, ride, box, fence, and wrestle. So far as the limited time will permit, he is allowed to take part in football, baseball, tennis, golf, and track athletics. Polo is compulsory for the first class.

Upon the completion of the course (June 12), cadets who have been two years at the Academy are allowed to go home on a furlough of two months. The remainder go into camp, during which they receive practical instruction in the exercises of the various arms of the service, including practice marches and tactical exercises. In addition, cadets of the third and fourth classes are taught dancing.

The superintendent is assisted by a military staff, and the instruction is given by an academic staff, consisting entirely of army officers, with the additional rank of professors, assistant professors, and instructors of the several departments in which they serve.

In 1902 the requirements for candidates seeking admission were raised. The increased requirements, while making entrance more difficult, greatly assist the student during his period of instruction at the Academy by reducing the amount of work he is called upon to do during his course. Under General Orders, No. 38, War Department, 1914:

"A candidate for admission to the United States Military Academy from a State, District, or Territory may be excused by the Academic Board from the mental examination for admission upon one of the following conditions:

"1. That he present a properly attested certificate that he is a regularly enrolled student in good standing without condition in any university, college, or technological school accredited by the United States Military Academy, provided that the entrance requirements for the course he is pursuing in such institution require proficiency in subjects amounting to 14 units of the College Entrance Examination Board, which must include mathematics A_1 (algebra to quadratics), A_2 (algebra, quadratics and beyond), and C (plane geometry); English A (reading and practice) and B (study and practice), as outlined by the College Entrance Examination Board. A certificate indicating enrollment at an irregular time or for the specific purpose of obtaining such certificate will not be accepted.

"2. That he present a properly attested certificate of graduation from a preparatory school or public high school which is on the accredited list of one of the institutions referred to above, provided that he is thus certified to have established proficiency in subjects amounting to 14 units of the College Entrance Examination Board, which must include mathematics A_1, A_2, and C, and English A and B, as outlined by the College Entrance Examination Board. A certificate indicating graduation at an irregular time for the specific purpose of obtaining such certificate will not be accepted.

"3. That he present a properly attested certificate from the College Entrance Examination Board that he has passed 14 units of its examinations, including mathematics A_1, A_2, and C, English A and B, and history A (ancient history) and D (American history and civil government)." After 1915 ancient history will not be required.

The system of training officers at West Point is regarded as more complete than that of any other country; but perhaps the greatest difference is the West Point method of holding the student firmly to his studies during his four years' course.

One feature of the system of instruction at the Military Academy consists in the division of each class into sections of from 7 to 12 cadets each, to each of which sections an instructor is assigned. Each cadet thus recites every day in every subject of his course of study; the result is a hold on his achievement and progress which would be impossible of attainment with larger classes. Transfers to higher or lower sections are continually made; an industrious attentive cadet thus realizes that his work will be recognized by promotion to a higher place in the class. Conversely, a cadet who neglects his studies is sure to "go down." This competition is valuable, because the original rank of graduates among themselves in the army depends on standing at the Academy. At the close of the four years' course, cadets of the highest standing are recommended, in numbers varying from year to year with local conditions, for all the corps of the army; these almost without exception pass into the engineers; then come a few recommended for all branches except the engineers. The remainder are recommended for cavalry, field artillery, coast artillery, and infantry.

The cadet mingles little with the outside world, except in his furlough at the close of two years, so that the four most impressionable years of his life are spent in a training and environment well calculated to produce a thorough soldier. The Academy has been described as a model institution by many distinguished European military authorities, and in the reorganization of the methods of military instruction in England many of the West Point ideas were suggested. The West Point cadet uniform (see UNIFORMS, MILITARY) is the famous cadet gray. The total number of graduates from 1802 to 1914 inclusive is 5347.

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MILITARY AËRONAUTICS. The application to and in the military service, whether ashore or afloat, of any device or apparatus intended (*a*) to carry passengers and war material from one point to another in the air, for purposes of observation or of destruction or both, and (*b*) to rise and remain in the air, at an altitude controllable within limits, for purposes of observation. Hence there must be considered, balloons, captive and free; kites (see under KITE; MILITARY OR MAN-RAISING KITE); dirigibles; aëroplanes; and organization and training of air service.

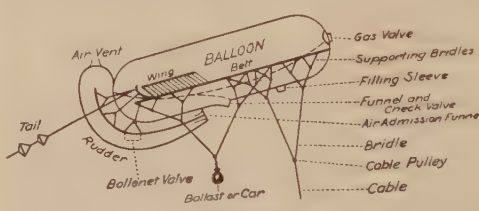
BALLOONS

Captive Balloons. The balloon was first used in war, and by the French, at the battle of Fleurus, June 26, 1794. This balloon, a captive one named the *Entreprenant*, was mounted by Charles Coutelle, and was of material benefit to the French General Jourdan by informing him as to the movements of the enemy. This same balloon was later used in the defense of Maubeuge, and in the sieges of Charleroi and Mayence, 1796.

No balloons were employed during the wars of the Empire. The French sent up one in 1859 before Peschiera; balloons were used during the American Civil War and by the United States troops in Cuba in 1898 before Santiago, where they proved not only a failure in respect of the acquisition of information, but a source of positive danger by giving the Spaniards the exact range. Since the development of the dirigible and the invention of the aëroplane spherical ballooning, whether free or captive, has diminished in interest and value. This is, however, not to say that it has become obsolete. For example, the French army in 1914 made use of *auxiliary* balloons (320 cubic meters) for colonial expeditions; of the so-called *normal* balloons (560 cubic meters), captive, for field service; of siege balloons (750 cubic meters) equipped with a ballonet; and of *ballons de place* (fortress balloons) 980 and 1600 cubic meters respectively, for free ascensions. All of these are inflated with hydrogen, save the 1600 cubic meter, which uses coal gas.

Spherical balloons are to-day *paneled;* i.e., whereas formerly the seams followed the meridians of the surface, they now in addition are sewed along seams parallel to the equator. This has the effect of limiting a tear, should one develop. Captive balloons are usually made of double vulcanized cloth, and thus do not require varnishing, besides being stronger, more impervious and more durable. To preserve the India rubber from the effects of the sun, balloons are painted with lead chromate, thus producing a characteristic yellow color.

Kite Balloons. The spherical captive balloon is open to some very serious objections: it offers a poor resistance to wind squalls; in a wind of 8 to 12 meters per second observation becomes difficult, and beyond 12 meters impossible. A German officer, Von Parseval, therefore conceived the idea of constructing a balloon which should at the same time be a kite, the so-called *Drachenballon,* or kite balloon. The stability of this balloon would increase as the wind rose and the only limit to its possibilities in this respect would be the strength of the materials used. It consists of a long cylindrical part closed at each end by a spherical cap. At the rear is attached a rudder of toric form, carrying at its



KITE BALLOON.

forward end an air-admission funnel and at the other a vent. In the interior of the balloon proper is situated a ballonet, whose function is to preserve the invariability of form of the system, and into which air is admitted by a funnel and valve. The tail of the kite consists of a series of reversed parachutes opened by the wind. To a sort of belt parallel to the axis of the cylinder are attached, forward, the bridles, which themselves work down to the main retaining cable. No net is used in this type of balloon; the car is suspended from bridles fixed to the rear.

As soon as the balloon is released it orients itself so that its main axis lies in the plane of the wind; this axis, moreover, is so inclined as to cause the nose of the balloon to lift. The wind now enters the rudder by the admission funnel; the rudder, inflated and assisted by the parachutes, fixes the orientation of the balloon. At the same time air begins to fill the balloon by the funnel, escape being prevented by a check valve. When the interior pressure becomes too great, relief is afforded by the escape of air into the rudder through the ballonet valve. The filling sleeve is always kept closed. Finally, should the pressure of the gas in the balloon exceed a certain limit, the interior wall of the ballonet bears upon the envelope of the balloon proper so that the latter pulls a cord communicating with the gas valve and automatically causes the latter to open. All danger of bursting by excess of pressure is thus eliminated. The supporting

effort of the balloon is increased by the effect of the wind on the rectangular lateral wings; these serve further to diminish the inclination of the balloon as the wind rises.

This balloon is the regulation captive balloon of the German and Austrian armies. If we are to believe the French, it is not after all superior to the French siege balloon; it ascends to a lower altitude for the same length of cable unwound; it is difficult to transport and to operate. However, in open country and on good roads, the Parseval even while up in the air can be transported from one point to another of a field, even at a trot. A small balloon (100 cubic meters) of this type has been used in France to carry the antennæ of the field wireless system. It may also serve to carry a photographic camera.

Use of Captive Balloons. Captive balloons may be employed to observe the movements and positions of the enemy and to guide indirect artillery fire. Reports are usually made by telephone. Conventional signals are also employed. In average country an altitude of 500 meters permits a reverse view of defiladed positions and, if the weather be clear, of observations as far as 7 kilometers. Before and during a battle an observer in a captive balloon may check the reports of cavalry reconnoissance, pick up reserves, make out field works, etc. During sieges captive balloons might be very useful. At night they may be used for the transmission of luminous signals as far as 30 kilometers. But after all is said and done, their use has always been limited: fog, rain, snow, would prevent observation and they are exceedingly vulnerable to artillery fire; if attacked, the only means of safety is to descend at once as rapidly as possible.

Naturally the possibilities of the captive balloon have led to the organization of balloon service and of balloon troops. As a rule, these troops belong to the Engineers, and are charged with the care, maintenance, and use of the material. Apart from the balloon proper and its equipment, the material includes vehicles for transport, trucks for ascensions, apparatus for generating hydrogen gas, and the necessary supplies, tools, etc., and is usually assembled and kept in balloon parks. These are stationed in the great fortresses, while the general administration, instruction of officers and men is managed by a central establishment. The train accompanying a captive balloon in the field is considerable, including the reel wagon with its tender, a tool wagon, tube wagons carrying compressed hydrogen, and wagons for the balloon equipment proper.

The siege-balloon train is somewhat smaller, but one of its wagons carries photographic equipment.

Free Balloons. Free balloons have no value in military operations save as a means of communication or of escape from besieged places. The Austrians, however, in 1848, made an attempt to use them to bombard Venice, but failed because the wind drove them off. At the siege of Paris, in 1870–71, between September 23 and January 28, 64 free balloons were sent out. These carried out about 2,500,000 letters and 358 carrier pigeons, of which 56 returned to the besieged city. Of the 64 balloons, 2 fell into the sea, 7 into the hands of the enemy, 12 others were captured, but their crews managed to escape.

DIRIGIBLES

The modern dirigible balloon owes its origin to the efforts of two French officers, Renard and Krebs, of the Engineer Corps, who, experimenting in 1884 and 1885, constructed a balloon, *La France*, 50.4 meters long and 8.4 meters in diameter, driven by a propeller actuated by an electric motor. A speed of 6.5 meters per second was attained, and under favorable conditions of wind and weather this balloon made trips, modest to be sure, but significant of greater progress. Since the work of the French officers, as is discussed under AËRONAUTICS, there have been important developments of the dirigible, but all things considered, so far as practical value is concerned, it is almost useless save for military purposes, and even in war its application and possibilities are limited.

Types. Three types of dirigibles are found in the military service. The semirigid and nonrigid are thought to be in many respects greatly superior to the rigid. Their chief advantage consists in the ease with which they can be taken apart and assembled, and in the fact that they can be transported deflated. The keel alone of the semirigid, however, calls for several freight cars, while the Parseval, a nonrigid dirigible, e.g., can be completely loaded on two. On the other hand, if the envelope should be torn, the semirigid and the nonrigid are put out of commission. To the usual classification into rigid, semirigid, and nonrigid some objection has been raised. In the first place the term "semirigid" is in itself improper, inasmuch as the balloon itself is collapsible, but uses a rigid member or frame to connect the car and its accessories with a gas bag. A more rational classification, according to French authorities, from the military point of view, would seem to rest on volume as the determining factor. We thus have:

Vedettes: 2000–4000 cubic meters and taking up three aëronauts. Limited radius of action; to accompany field armies and remain as close as possible to the enemy; easy to handle and to transport; rapidly inflated; no special hangars needed.

Scouts: 6000–7000 cubic meters. Capable of remaining up a considerable time and of going far; of special value when hostile armies are making their approach marches; special hangars needed.

Cruisers: "aërial dreadnoughts," exceeding 10,000 cubic meters; able to go far and remain up a long time, and thus available for strategic reconnaissance; to be concentrated near frontier and ready to start at the first signal; special hangars needed.

But this classification is almost completely robbed of any value by a brief consideration of the requirements a military dirigible must satisfy. In order to be safe from hostile fire a dirigible must rise to a considerable altitude. This altitude is at least 1500 meters, and will increase as balloon artillery improves. Moreover, since it is important that a dirigible shall pass as little time as possible in friendly territory, it must reach this minimum altitude as rapidly as possible and there maintain itself during the greater part of its journey. Hence the condition imposed upon dirigible builders of furnishing a machine that will stay up for a considerable number of hours and remain for at least two-thirds of the time at an altitude of at least 1500 meters. An airship failing to satisfy these

conditions would have very little military value. In order to control rising there must be ballast; if, further, long voyages are contemplated, the supply of ballast must be increased; we thus necessarily arrive at the conclusion that the military dirigible must be of great volume.

The present tendency is towards the construction of the dreadnought class. In illustration of the progress made we may compare the German M I of 1912, of 6000 cubic meters, equipped with two motors of 75 horse power each, developing a speed of 45 kilometers an hour, and having two propellers; with the Z VIII, built in 1914, of 22,000 cubic meters, having three motors of 180 horse power each and four propellers. The Zeppelins actually built on Jan. 1, 1914, with 540 horse power, developed a speed of 77 kilometers an hour. The comparison is still more striking in France. Thus, the Ville de Paris, of 1906, of 3200 cubic meters, speed 43.2 kilometers an hour, developed by one 70-horse-power motor, and with one propeller, is plainly obsolete when compared with Astra XVI, of 23,000 cubic meters and a speed of 90 to 100 kilometers an hour, developed by four 250-horse-power motors actuating four propellers.

So rapid has been the evolution of airship design that dirigibles built before 1910 by the time of the European War which began in 1914 were quite obsolete. In the development of actual type most nations were content to follow models of French or of German origin. In the construction of some of their ships, however, the Italians even before the European War exhibited originality by inclosing the stiffening member or frame in the gas bag itself. This frame is not rigid, but composed of articulated panels, thus accommodating itself to the variations of form of the envelope. The car of the P class (containing dirigibles of smallest volume) is of steel and water-tight, so that in case of need it may float on the surface of the water. In the M class (M = mean, between the smallest class, P, and the largest, G) the car is of steel and completely closed, and thus shelters the crew from wind and weather and at high altitudes. These are real military qualities, for they permit the balloon to go out under unfavorable climatic and weather conditions. In the G class the car forms an integral part of the balloon body. A later type was a crewless dirigible operated by Hertzian waves. These work one propeller forward and two aft, and a fourth, of vertical axis, under the car and thus helping the dirigible to rise. It was said that the trials of this dirigible in July, 1913, turned out very well. We give below, illustrating type, equipment, speed, etc., lists of the war dirigibles of Germany and of France respectively. The latter contains only the airships recognized by the French as having any military value. The tables giving the published state of affairs as it existed early in 1914 just before the war are taken from Rasch and Hormel's *Taschenbuch der Luftflotten* for 1914, though some differences, occasionally quite marked, will be noticed when such information is compared with French authorities.

On Jan. 1, 1914, the military airship (army and navy) fleets of the world were as shown in table at top of page; and to these must be added a certain number of commercial and experimental ships, of which on Jan. 1, 1914, Germany had nine (one building), France two, Italy three, Japan one, Austria two. Germany excepted, none of these has any military value.

There is reason to believe that the number of military dirigibles in existence at the outbreak of the European War was considerably greater than the number published, and during

COUNTRIES	In service	Building
Germany	12	7
France	*17	†10
Belgium	1	..
England	7	2
Italy	9	2
Japan	1	..
Holland	1	..
Austria-Hungary	3	..
Russia	13	4
Spain	2	..
Turkey	1	..
United States	1	..

* Including three not recognized as of military value.
† Includes Astra XV, XVI.

the progress of the war new dirigibles were built and placed in commission, while others were destroyed. It is reported that L I, L II, L III, L IV, and L VIII have all been destroyed, wrecked, or lost.

Employment of the Dirigible. Dirigibles may be used in two ways: (1) in the acquisition of information; (2) in the infliction of damage upon the enemy. Certain general conditions affect both uses. The dirigible must be equipped with means of communicating with its own side. So long as it remains within the working range of telescopes or field glasses it may use visual signals; when beyond this range it must have recourse to wireless telegraphy. Since a dirigible is liable to attack by other dirigibles or by aëroplanes, it must carry rapid-fire or machine guns to beat off such attacks. By reason of its very nature the dirigible must have a "port" or base, at which are found the hangars for housing the dirigible when not on service, machine and repair shops, gas generators, in short all the apparatus and tools for use and maintenance.

Information. Bearing in mind the constitution of airship fleets, the nature of the duty will depend on the volume of the dirigible. The smaller airships naturally will be useful for tactical reconnoissances, e.g., to report on armies executing their marches of approach; they may conceivably be employed even when armies are in actual hostile contact. The value of such reconnoissance will naturally depend on the rapidity with which the information obtained may be transmitted to the headquarters interested. Obviously wireless telegraphy is here indicated. Communication by this means over a range of 300 miles and more is an accomplished fact. On the actual field of battle accurate information may be sent of the emplacement of the hostile batteries—information of the greatest value and importance—as well as of the general situation of the enemy. This sort of work, however, falls more naturally to the aëroplane, as indeed will probably be found the case with all close work.

Dreadnoughts, the "battleships" and "battle cruisers" of the air, would be used on what is known in the military profession as "strategic reconnoissance," i.e., on long journeys into the heart even of the enemy country, for the purpose of detecting the concentration of troops and the direction of great movements. This function calls for the installation during peace of stations near the frontier, from which without loss of

time dirigibles may proceed into hostile territory. Such stations were found along both sides of the Franco-German frontier, in the great fortified positions, e.g., Metz, Strassburg, Verdun.

Offensive Employment of the Dirigible. Even before the war military authorities expected no great results from bomb throwing and this opinion has been sustained. This must not be understood to mean that such results are impossible or even improbable. With improved apparatus for releasing the bomb or projectile, with more experienced operators, it is possible that success will be attained. It appears to be true that at altitudes safe for the dirigible the expectation of hits is slight; at lower altitudes the dirigible would probably be destroyed before achieving any useful purpose. Since the supply of really destructive ammunition that may be carried along is limited, the possibilities of destructive effect are limited. If the attack fail, the journey of the dirigible is worse than useless, and in any case its ammunition once exhausted, it must return to its home port in order to replenish. It is conceivable of course that a government disposing of a fleet of say 25 or 30 dirigibles may send it to hover over an army, or the capital, or a great fortress, over dockyards and arsenals, in the hope of sending down so many projectiles, incendiary and others, that some of them will strike the target. But, as before remarked, if the fleet remain at a safe height, its own fire is uncertain; if it descend so low as to assure a reasonable expectation of hits, it exposes itself to the high angle fire of the defense. It would seem from the state of affairs, so far as made known, and the experience of the European War, that the dirigible has been a disappointment to its partisans. Offensively its performance would seem to have been negligible; whether it achieved in reconnoissance results more tangible is not as yet known.

Defects of the Dirigible. The dirigible is open to some objections, the chief of which may be summed up in one word—bulk. A corollary is its inability to operate by day through fear of hostile aëroplanes. The first cost of a military dirigible of the dreadnought class is great—in the neighborhood of $500,000. Compared with other items of the military budget, this is not in itself a large sum. But it is large compared with the cost of an aëroplane—$12,000 to $15,000—when it is considered that both machines have similar functions. If a remedy be sought in the construction of smaller dirigibles, we must realize that, although the first cost is much reduced, nevertheless a large sum has been spent to build an instrument whose work can be as well done, if not better done, by a much less expensive machine, the aëroplane. In fact, as the dirigible diminishes in volume its functions tend more and more to coincide with those of the aëroplane. In particular its offensive powers, varying as these do with carrying capacity, tend to disappear, or at least to reach so low a point as to be more than compensated by the superior advantages of the aëroplane, in respect of reconnoissance. Accepting, then, the fact that the dirigible must be of great volume, it is clear that its plant must be of vast size and correspondingly costly. A dirigible in

GERMAN DIRIGIBLES (1914)

NAME AND YEAR BUILT	Volume cubic meters	Length meters	Maximum diameter meters	Motor and horse power	Speed kilometers per hour	Number of propellers	Useful load kilograms	Maximum ascension meters	Type
M IV 1913	13,000	97	13.5	3 Körting of 150 H. P.	75	..	....	....	Semirigid
M I 1912	6,000	74	11	2 Körting of 75 H. P.	45	2	1,250	....	Semirigid
P IV 1912–13	10,000	84	15	2 Maybach of 180 H. P.	71	2	3,500	2,500	Nonrigid
P III 1911	10,000	84	15.5	2 Körting of 200 H. P.	65	2	2,800	2,000	Nonrigid
Ersatz P II 1910	8,000	77	14	2 Maybach of 180 H. P.	51	2	2,200	2,000	Nonrigid
Z VII 1913	22,000	156	14.8	3 Maybach of 180 H. P.	..	4	....	....	Rigid
Z VI 1913	19,500	141	14.8	3 Maybach of 180 H. P.	77	4	....	....	Rigid
Z V 1913	19,500	141	14.8	3 Maybach of 180 H. P.	77	4	....	....	Rigid
Z I 1913	19,500	141	14.8	3 Maybach of 180 H. P.	77	4	....	....	Rigid
Z IV 1913	19,500	141	14.8	3 Maybach of 180 H. P.	77	4	....	....	Rigid
Z III 1912	17,500	140	14	3 Maybach of 150 H. P.	78	4	....	....	Rigid
Z II 1910–11	17,800	148	14	3 Maybach of 150 H. P.	76	4	....	....	Rigid

GERMAN AIRSHIPS BUILDING (1914) *

S. L. II	23,000	144	18.4	4 Maybach of 180 H. P.	80	4	8,000	....	Rigid
Z VIII	22,000	156	14.8	3 Maybach of 180 H. P.	..	4	....	....	Rigid
L IV (navy)	30,000	165	18.4	4 Daimler of 240 H. P.	80	4	14,000	....	Rigid
L III (navy)	27,000	...	...	4 Maybach of 180 H. P.	..	..	....	....	Rigid

* Previous to war.

a fixed shed is a prisoner until the wind is favorable to its issue. The objection is removed, however, by constructing a revolving hangar, such as those built by the Siemens-Schuckert firm in Germany at Biesdorf. This opens at both ends, and may turn 90° either to the right or to the left. It is even proposed to construct subterranean or semisubterranean hangars, into which the ship would be allowed to sink, and then be closed in by a trap-door roof. The cost of these installations would evidently form a serious item in the military budget.

On the outbreak of war the fleet would of course use the stations established during peace on or near the frontier. If these, however, should be destroyed, or if an invasion should be made into the heart of a country, then, if dirigibles are to accompany the army, either a dismountable plant must be provided as a part of the train or the ship must return to a far-distant base. The transportation of such a plant would be a serious matter; the absence of the ship might involve a military disadvantage. The transportable mooring mast of the English army furnishes a sort of solution, but so far as known it is used for only very small models. A dirigible that has landed in the open, if it cannot be sheltered, is at the mercy of the wind. But as yet no dirigible has been built which is able to "keep the air," not to say indefinitely, but for a relatively long time, a week or two weeks, without landing. It must return to its own or to some other base or make a landing in order to renew supplies. It is a fact that some dirigibles may remain up 30 hours and longer, and it is certain that this duration allows an ample margin of time for action. But it is also a fact that, from its bulk, the dirigible is vulnerable, far more vulnerable than the aëroplane.

FRENCH WAR DIRIGIBLES *

NAME AND YEAR BUILT	Volume cubic meters	Length meters	Maximum diameter meters	Motor	Speed kilometers per hour	Number of propellers	Useful load kilograms	Maximum ascension meters	Type
Conté 1912–13	9,130	82.5	14	2 Chenu of 200 H. P. each	65.5	2	....	3,050 (recow)	Nonrigid
Lieut. Chauré 1911	8,950	86.7	14	2 Chenu of 200 H. P. each	52	2	....	....	Nonrigid
Adjudant Réau	8,950	86.7	14	2 Brasier of 120 H. P. each	52	3	....	2,150	Nonrigid
Colonel Renard 1909	4,300	60.4	10.5	1 Panhard-Levassor of 110 H. P.	46	1	....	....	Nonrigid
Dupuy de Lôme 1912	9,000	88	16	3 Chenu of 130 H. P. each	55	2	2,900	2,940	Nonrigid
Adjudant Vincenot 1911	9,000	88	16	2 Clement-Bayard of 130 H. P. each	56	2	2,717	1,967	Nonrigid
Capitaine Marchal 1910–11	7,200	89	14.6	2 Panhard-Levassor of 80 H. P. each	45	.	....	....	Semirigid
Lieut. Selle de Beauchamp 1910	10,000	89	14.6	2 Panhard-Levassor of 80 H. P. each	45	2	1,685	....	Semirigid
Liberté 1909–10	7,000	85	12.8	2 Panhard-Levassor of 80 H. P. each	53	2	....	....	Semirigid
Spiess Rebuilt 1913–14	16,400	140	13.5	2 motors of 200 H. P. each	70	4	....	....	Rigid
Capt. Ferber 1911	6,000	76	12.4	2 Dansette-Gillet of 110 H. P. each	56	2	2,500	2,000	Nonrigid
Commandant Coutelle 1911	9,500	92	14	2 Dansette-Gillet of 200 H. P. each	62	4	....	....	Nonrigid
Le Temps 1911	2,500	50.4	9.5	1 Dansette-Gillet of 110 H. P.	50	2	....	....	Nonrigid
Fleurus 1912	6,500	77	12.4	2 Clement-Bayard of 80 H. P. each	..	.	....	....	Nonrigid

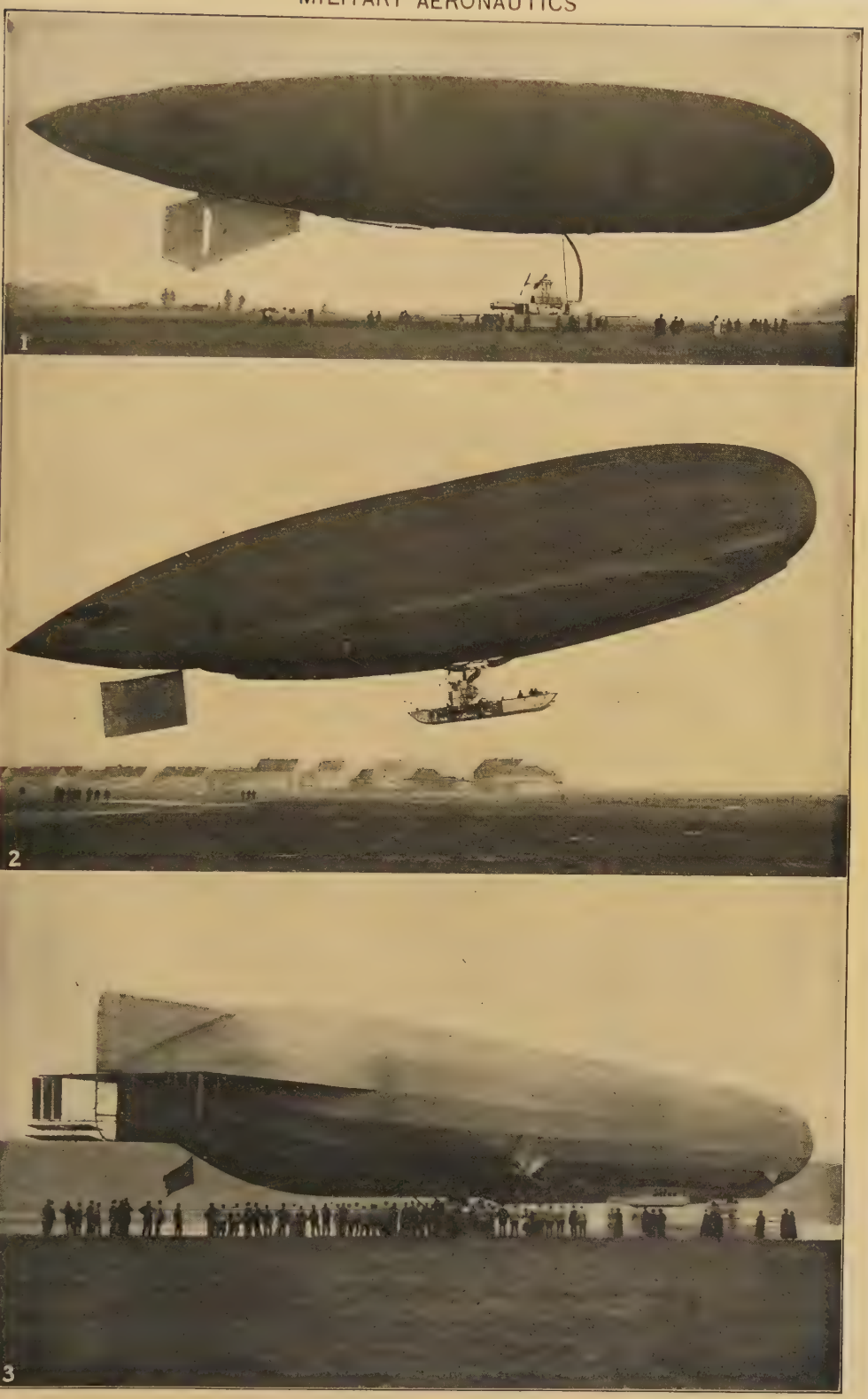
FRENCH AIRSHIPS BUILDING (1914) †

Astra XVI	23,000	120	16	4 Chenu of 250 H. P. each	90–100	4	....	....	Nonrigid
Astra XV	23,000	120	16	4 Chenu of 250 H. P. each	90–100	4	....	....	Nonrigid
Clement-Bayard VII and VIII	22,000	...	...	4 Clement-Bayard of 250 H. P. each	65	.	....	....	Nonrigid
Lebaudy XI	17,000	110	15.5	3 Panhard, 1000 H. P.	..	.	....	....	Semirigid
Lebaudy X	10,000	103	14.5	3 Panhard	..	2	....	....	Nonrigid
Zodiac 16	17,000	110	15	3 Chenu, 1000 H. P.	..	.	....	....	Nonrigid
Zodiac 14–15	10,000	95	13.5	2 Panhard	..	2	....	....	Nonrigid
X	17,000	110	15	2 Dansette-Gillet of 600 H. P. each	..	.	....	....	Nonrigid

* French war dirigibles were to have their name in large black letters on undersurface of front of balloon, and to carry national colors.

† Previous to war.

The maximum ordinate of the trajectory of the 6.5 centimeter Düsseldorf gun is given as 7900 meters, that of the 10.5 centimeter as 8300 meters. To say nothing of the present impossibility of a dirigible's rising to such a height (the altitude record for dirigibles is 3300 meters) it is clear that long before reaching it its usefulness both in offense and reconnoissance would be very seriously diminished if not completely destroyed. The dirigible is further seriously exposed to aëroplane attack, against which it might prove helpless, unless escorted by its own combat aëroplanes. The value of the dirigible is greatly reduced at night; at useful alti-



TYPICAL EUROPEAN MILITARY DIRIGIBLES

1. "PARSEVAL XI", A TYPICAL GERMAN ARMORED AIR CRUISER
2. "EUGÈNE MONTGOLFIER", A FRENCH CLÉMENT-BAYARD DIRIGIBLE
3. GERMAN NAVAL ZEPPELIN STARTING FROM WATER AT POTSDAM

TYPICAL AËROPLANES OF THE GREAT EUROPEAN WAR

1. FRENCH ARMORED NIEUPORT MONOPLANE.
2. THOMAS (AMERICAN) HIGH SPEED BIPLANE.
3. BRITISH SOPWITH SCOUT MILITARY TRACTOR ARMORED BIPLANE. Many of these machines were used in raids over German territory for bomb dropping.
4. CURTISS (AMERICAN) MILITARY TRACTOR, MODEL "N".

tudes its bulk in clear weather should be easily discernible, where an aëroplane would be practically invisible. Again, the proper speed of a dirigible must exceed by 4 or 5 meters that of any wind it may have to meet; a speed of 20 meters would allow a dirigible to proceed on 85 days out of 100, one of 12 meters on 40 out of 100. If we diminish these numbers on account of rain, snow, or fog, and take into account gas leakage, it is clear that the usefulness of the dirigible would be still further reduced. Obviously some of the objections cited will lie also against the aëroplane, but in a lesser degree, because of lower cost, greater ease of handling, comparative invulnerability, and ability to profit by fleeting opportunities not within the grasp of its bulky rival. Lastly and in general, the dirigible must for the present be regarded as a more or less delicate machine, exposed to danger from fire, e.g., from the blast of its own guns, weather, and the unforeseen causes of disaster.

Advantages of the Dirigible. The dirigible is superior to the aëroplane in that it affords a better gun platform, can carry heavier guns, can navigate by night, remain in the air a much longer time, and carry a much greater useful weight. Its wireless equipment has a much longer range. In gun practice some notable results have been attained; e.g., the German Z V at Döberitz early in 1914 made hits on a target 12 by 3 feet at a range of over 1800 yards. In yet other trials a 2-inch gun at an elevation of 2000 feet scored bull's-eyes on a target 30 by 15 feet suspended 1000 feet in the air from a kite balloon; this gun was mounted on top of the gas bag. Z VIII ascended on March 29, 1914, to a height of 10,000 feet, and, as a further example of the possibilities of the dirigible, L III (since reported lost in 1915), after a trip of 35 hours at 62 miles per hour, had enough fuel left for a journey of 16 hours more. This airship carried a searchlight of 40,000 candle power.

AËROPLANES

That motor flying should have made a special appeal to the military profession was perfectly logical; sporting apart, no real use for flying has so far been imagined comparable with that of the service of reconnoissance in war. In 1909, at the Rheims meeting, the first real tests of aëroplanes from a military point of view so impressed the French government that it ordered several Wright machines for military use. It was at this meeting that the Gnome motor first appeared. In 1910 we find the French using aëroplanes (and dirigibles) at the fall manœuvres held in Picardy, with results so satisfactory as to lead to the prediction that the whole service of reconnoissance would be revolutionized.

The progress of military flying was still further strikingly displayed at another notable aviation meet held at Rheims in the following year, and at the Paris Aëroplane Salon, which marked the close of the aëronautical season of 1911. The machines shown indicated that at least an approximate solution had been reached of the various problems of military flying. The engines were more powerful; an improvement had been made in the landing chassis in respect of both strength and simplicity. The single-seat, high-speed monoplane attracted very serious attention; indeed it may be said that this machine emerged approximately as a distinct and important type. Capable of reaching a speed of 80 miles an hour, it was recognized that a most valuable instrument of reconnoissance had been created, limited, to be sure, in its purpose, but that purpose possibly of the most vital importance.

In the development of military aëroplanes France early took and maintained the lead. In 1912 she appropriated nearly $5,000,000 to military flying, an amount increased by a popular subscription of $500,000. Germany, wedded to the dirigible, and at first regarding flying as of limited value, nevertheless took alarm after the French manœuvres of 1910, and with characteristic thoroughness set to work to build machines and to develop and train military flyers. In 1912 she appropriated over $3,000,000 for this element of her war power, and increased the amount to $10,000,000 in the budget of 1913. Russia followed suit and her aërial budget in 1911 was $5,000,000. Austria, Japan, Italy, and Spain then took up the subject. England was far slower; it was not until 1912 that she gave it serious consideration. What was expended by the combatant nations in connection with the great war is of course only a matter of conjecture until the publication of the detailed budgets. In the meantime it is reported that orders to the value of $16,000,000 have been placed in the United States by European nations at war, for aëroplanes and motors.

Use of the Aëroplane in War. Like the dirigible, the aëroplane has two functions in warfare—reconnoissance, involving the acquisition and transmission of intelligence, and attack, the infliction of damage upon the *matériel* and *personnel* of the enemy. Of these reconnoissance far outweighs the other in importance and value. The applicability of the aëroplane to the business of collecting information has been almost self-demonstrated from the start; its usefulness as an engine of destruction remains on the whole undeveloped. Other uses have suggested themselves during the course of the war. Daily communication between Przemysl and the Austrian lines seems to have been maintained by aëroplane. Russian aviators have been employed to bring up ammunition from the distant rear. These cases, however, are special.

Information. Air craft, i.e., dirigibles and aëroplanes, have no effect on strategy, the principles of which are declared to be immutable. But having in view the hugeness of modern armies, preliminary strategical operations must to-day be carefully considered; the strategical plan once adopted, air craft may serve to accelerate the passage to the tactical phases of the situation. This effect can never be great, however, since it is to the interest of any army to reach the tactical phases without loss of time. It is therefore in the domain of tactics that we must seek the influence of air craft. This statement almost shuts us up to a consideration of the aëroplane alone. The dirigible conceivably is superior in strategical reconnoissance, because of its ability to keep in the air longer than its winged rival, and especially because it is better adapted to navigate by night; but in tactical reconnoissance, in the observation of troops after they have left the roads, after they have taken up the formations leading to combat, the dirigible must take second place.

In its simplest terms the military problem to be solved by a military aviator consists in

knowing how to get the information wanted and to transmit it to the headquarters interested; hence the military aviator must be able, in full flight, to read a map, must thoroughly understand the three arms, be acquainted with their formations, and know how to follow a manœuvre.

From the earliest time of mobilization, concentration, and advance of an enemy, each side to obtain information resorts to reconnoissance, carried out by both infantry and cavalry, but chiefly by cavalry. Since each side is doing its best to conceal its own strength and purpose from the other, there results what is called the "fog of war," i.e., the uncertainty as to the immediate purposes of the enemy and as to the means he employs to carry them out. In spite of all efforts the information brought in to headquarters may be untrustworthy, if only because it may be several hours old before it is received.

TYPES OF MILITARY AËROPLANES

I. GERMANY *

DESCRIPTION	Length over all meters	Spread meters	Area of supporting surface square meters	Speed, kilometers per hour	Motor and horse power	Climbing power	Weight kilograms	Useful load, kilograms	Supply of fuel carried	Number of propellers and mode of mounting	Remarks
Ago monoplane..... 1913–14	8	9	15	135	Argus, 150	1000 meters in 8 minutes	...	...	...	One; tractor	Not an army machine
Albatros biplane....	8	14.5	40	110	Argus and Mercedes, 100	1000 meters in 8 minutes	620	200	For 4 hours	One; tractor	Army
Aviatik biplane....	8	14	48	100	Argus and Mercedes, 100	1000 meters in 8 minutes (full load)	690 (unloaded)	200	For 4 hours	One; tractor	Army
L. V. G. biplane.... 1913	9	14	..	100	Argus and Mercedes, 100	.....	400 (unloaded)	..	...	One; tractor	Army
Rumpler monoplane 1913	9.85	13.25	32	100	Argus and Mercedes, 100	.....	400 (unloaded)	..	...	One; tractor	Army

II. ENGLAND

Bristol biplane..... 1913	8.6	11	38	67–100	Gnome, 80	.....	430 (unloaded)	300	For 4 hours	One; tractor	Army
Martin-Handasyde . 1913	10.6	13	26.5	105	Dansette-Gillet, 80	.....	300 (unloaded)	250	...	One; tractor	Army
Handley-Page biplane	...	13.25 (upper surface)	38.5	...	Anzani, 100	.....	...	..	...	One; tractor	Army

* German military aëroplanes carry on the undersurfaces of the wings a large black Maltese cross.

III. FRANCE *

DESIGNATION	Length over all, meters	Spread meters	Sup'ting surface, sq. m'rs	Speed, km. per hour	Motor and horse power	Weight kilograms	Useful load, kilograms	Supply of fuel carried	Number of propellers and mode of mounting	Remarks
Blériot biplane..... 1913–14	9.15	12.7	36	..	Gnome, 80	400 (unloaded)	250	.....	One; tractor	Army
Deperdussin monoplane 1913	7.3	10.6	..	105	Gnome, 80	...	...	.....	One; tractor	Army
Clément-Bayard monoplane 1914	9.5	9.2	16	120	Gnome, 80	320 (unloaded)	200	.....	One; tractor	Army
Farman biplane..... 1913	8.32	14	..	110	Gnome, 80	...	...	In 1914 carry gasoline for 24 hours in special tanks	One; rear mounting	Army
Nieuport monoplane...	8	....	14	140	Nieuport, 85	240 (unloaded)	...	.....	One; tractor	Army; in 1914 armored type carrying automatic rifle
Nieuport-Dunne biplane 1913	6.75	14.75	50	95	Gnome, 80	425 (unloaded)	...	For four hours	Two; rear mounting	Not an army machine
Zodiac biplane.....	11.75	15 (upper surface)	32	95	Gnome, 50	460 (unloaded)	250	.....	One; tractor	Not an army machine

IV. RUSSIA

Sikorsky biplane, "Ruski Witjas"	20.2	28.2	125	...	4 Argus of 100 H. P. each	...	...	.....	Four; tractor	Not an army machine

* French military aëroplanes, it was announced, should carry on the under side of each wing (lower wing in biplanes) a tricolor cockade one meter in diameter.

Hence it has been the business of military genius, other things equal, to pierce this fog of war and by the proper use of troops to beat the enemy.

The aëroplane has almost completely dissipated the fog of war. Long before an army comes up its strength and composition are known, its direction and rate of march disclosed, its purpose revealed. Suitable measures can therefore be taken in ample time, for doubt has given way to certainty, and a commanding general may act in full knowledge of the task before him.

So complete and accurate is the information possible by air scouting that enthusiasts have declared that the reconnoissance duty of cavalry has become obsolete. But to accept this view would be to fall into grave error. With two armies at grips, or about to come to grips, much remains to be done by the intimate, immediate, and local reconnoissance, both of the ground and of the enemy by the troops immediately interested; in other words, the aëroplane can never be made to feel the enemy. The aëroplane is of inestimable value in giving notice, as already said, of an impending attack, and even of the nature of the attack; the immediate dispositions however, must, as before, be left to the troops themselves.

To form a concrete idea of the service of reconnoissance possible to the aëroplane, a machine doing no more than 80 kilometers per hour may fly say 125 kilometers in advance (four days' march) and observe a strip from 8 to 10 kilometers wide. The information brought in, if the machine returns, will be only an hour or two old when received; with wireless, it would represent at the moment the exact military situation. Now this information, if sent in by cavalry patrols, may be 24 or 48 hours old. Moreover, cavalry can never report more than the "apparent contour," whereas the aëroplane looks down into the heart of things. It may do admirable service in the transmission of orders and for establishing contact between troops engaged. The opportunity for this presents itself when roads are choked with troops and guns, when telegraph and telephone lines are cut, and wireless ceases to operate.

Some idea of the importance of air service may be formed from the record of over 18,000 hours of flight, and distance of 1,800,000 kilometers by French aviators. The other combatants no doubt can furnish similar records.

Moreover, the aëroplane has directly intervened on the battle field itself. Thanks to the increased range and calibre of modern artillery, effects, sometimes surprise effects, are possible at distances undreamed of in elder days. The case may be even more generally stated: so powerful is the modern gun, whether the classic fieldpiece or the larger calibres brought into action in later years, that distant action may be said to be the rule. But in order to produce results the nature of the target and the range must be exactly known. Now, in obtaining these elements the aëroplane is of the greatest value, as appears when we recollect that modern fire is indirect, i.e., the batteries engaged do not see the target. Hence it has been found necessary for the captain of a battery to take his post at some point from which he could observe the fall of the projectiles and so correct his practice. The aëroplane to-day enables the battery to *see;* it indicates targets, checks and corrects fire. Communication upward, from the commanding officer of the battery with the aviator, is easily established by means of visual signals. Communication downward is effected by dropping written indications suitably weighted within easy reach of the battery. Doubtless improved methods will be adopted in time. See FIELD ARTILLERY.

More generally, the aëroplane reveals the extent of the position occupied by the enemy on the field, the number and position of his reserves; from its reports the general may decide whether a turning movement is possible or desirable, when the moment has arrived for a general offensive movement. According to one authority, "it may be and will be offensively used to bombard important points, such as hills, woods, river banks, bridges, etc. Aëroplanes equipped for offense will be held in reserve and sent out just before the assault to drop their projectiles upon these points in such volume that no troops could possibly remain in the position." The aëroplane may warn its own side of the dangers to which it is exposed from batteries whose presence within range would otherwise be unknown, and thus lead to the adoption of measures either to destroy the batteries or to seek protection from their fire. We cite a few instances from the present war. A single French aviator on Feb. 17, 1915, discovered 21 enemy batteries. Air reconnoissances in the Dardanelles succeeded in locating new gun positions in the forts, a line of surface mines, encampments, and permanent batteries. Aviators flying over the German lines in the La Bassée district picked up six batteries, which a few minutes later were being shelled by the French Artillery (February, 1915). The success of the British Artillery at Neuve Chapelle is in no small measure due to the air service. It has increased the effect of infantry fire; will probably be found of great assistance in coast defense, and lead to increased use of movements by night and to attempted concealment by day.

In reconnoitring the ground from an aëroplane telephotography has been found extremely useful. Not only may a terrain otherwise inaccessible thus be forced to reveal its nature, but the results of the reconnoissance are brought in long before an ordinary reconnoissance patrol could have set to work. Military features are presented in their relation to one another; by suitably projecting them upon a map distances may be accurately measured. Other valuable information may also be obtained, such, e.g., as the possibilities of a defensive position or the seriousness of the opposition to be expected at a given point from its physical configuration.

Photographic views may be obtained by the use of the ordinary camera with the telephoto lens, by a motion picture camera which presents a continuous view of the section over which the aëroplane or dirigible passes, or by the use of the phototopographic camera, invented by Capt. Scheimpflug of Vienna, Austria, by which a combination of lenses presents an accurate view of an area of 32 square miles if taken from an elevation of 3000 feet or of 126 square miles if taken from an elevation of 6000 feet.

Inasmuch as the aëroplane is above all things an instrument of reconnoissance, the question of communication with it, and of receiving information from it, while in flight, is of the first importance. Among all methods tried, obviously wireless telegraphy holds first place.

The installation of wireless on board an aëroplane in some respects is notably different from installation at a permanent station. No ground connection for the antennæ is possible, so a second aërial or "counterpoise" is employed to replace the ground. In the aëroplane two systems exist; in the first, a fine trailing or drop wire, almost a hundred feet long, is used as an antenna, and the counterpoise is formed by the fuselage and metallic parts; in the second, an aërial is permanently fixed to the aëroplane, and the counterpoise consists of a second antenna similar to the first. The first system is the better in respect of efficiency; but the trailing wire may be caught by objects on the ground in case of sudden descent, or in the propeller itself. This last disadvantage disappears of course in the tractor type of aëroplane. The permanent aërial set has one serious objection—its small range of communication, not over 10 or 12 miles. In the matter of apparatus the generator and transformer are greatly superior to the induction coil. On account of the noise of the motor it is easier to send messages from an aëroplane than to receive them on board. This difficulty however, will very likely be removed by the perfection of a device to shut out to a great extent the noise of the motor and at the same time to increase the strength of the received signals. It should be remembered, too, that it is far more important for an aviator to send than it is to receive.

Other means of communication are visual signals, such, e.g., as the Means smoke telegraph. This is an apparatus emitting long and short puffs of smoke as desired, thus producing visually the dots and dashes of the Morse telegraph code. A similar apparatus tested in France consists of a tube parallel to the main axis of the machine and so placed as to catch the blast of the propeller. To this tube is connected by a suitable valve a reservoir of lampblack; by opening and shutting the valve long or short puffs may be produced, thus giving the Morse alphabet. Signals are visible at 10 miles. In Germany a lamp using an Edison accumulator has been invented showing green to starboard and red to port for 110 degrees, and white forward and aft. The current may also be used to light up the instruments on board; by introducing a keyboard signals may be made. Other visual methods are flashing lamps by night, between air craft in the air or between them and the ground. On dirigibles the semaphore may be used. Written messages of course may be dropped at prearranged points or where needed; parachutes may be used for this or messages may be merely weighted. A special apparatus for this class of communication is Fugairon's: a hollow cylinder carrying the message is fitted with a mercury-fulminate cap which on landing ignites a charge of Bengal fire and so attracts attention. This signal may be seen by day.

THE AËROPLANE AS AN ENGINE OF DESTRUCTION

The possibility of using the aëroplane to inflict damage upon the enemy has of course been a matter of discussion and experiment. Given a machine able to pass, if not to hover, over an enemy or his arsenals, dockyards, depots, etc., and itself apparently out of harm's way, the idea of using this machine to injure the enemy is alluring. And apparently nothing could be easier than to drop a bomb, whether explosive or incendiary, upon the target; if the target be large enough, a miss would seem to be impossible. But a little reflection shows that the conditions under which an aëroplane must work militate against the success of its offensive effort. It must maintain a certain speed; any error in the evaluation of this speed destroys the accuracy of the fire. In order to be safe itself from hostile fire it must remain at a certain height, and at 1000 meters in the air infantry fire is still to be avoided. Now, the greater the altitude, the less accurate becomes the practice of the aëroplane. Moreover, projectiles dropped or launched from great altitudes may encounter air currents wholly different from those in which launched and thus be deflected from the target. This condition is general, defies correction, and is independent of the precision of the instrument used and of the skill of the operator. Its effect increases with the crudeness of the ammunition; i.e., pear-shaped bombs, even spherical projectiles, apart from their inherent inferiority to ogival projectiles, are more likely to be affected by the perturbations of the atmosphere than a projectile designed to stay on its intended trajectory. The uncertainty attendant upon the use of primitive ammunition is so great that we may regard this sort of fire as almost useless. A pear-shaped bomb, dropped or thrown from an aëroplane going at speed at a great altitude, will probably miss its target. The conditions laid down, so far, as affecting the precision of bomb dropping, naturally, other things being equal, apply to aimed fire from a suitable gun carried by an aëroplane.

Of a different sort is the limitation imposed by the nature of the machine itself—the impossibility of carrying explosives in any serious quantity. But this limitation may prove only temporary. An aëroplane able to carry 1000 pounds of explosive is entirely possible, and it is conceivable that a fleet of 20 such machines might do an immense amount of damage, even if only one of four projectiles should find the target. Much would depend upon the nature of the target; e.g., dockyards, dirigible sheds, reserve troops of all arms in mass or in bivouac, especially if surprised—all or any of these might suffer great damage under aëroplane attack, where troops intrenched might escape serious injury. If the target is able to defend itself, the aëroplane's chances of hitting are still further reduced. As is well known, the accuracy of gun fire from the surface of the ground is checked by observation of the fall of the shots. Such control would be extremely difficult if not impossible for an aëroplane. But it would not be impracticable in an attack delivered by an air fleet to cause one machine to expend ammunition in trial shots, under the observation of its companions, and so enable these, on receiving by signal or wireless the data used, to open fire with increased chances of success. And it is obviously always possible for a skillful and daring aviator by a well-placed bomb to destroy a gun, wreck a troop train, or stampede a cavalry regiment. But after all these results would be only local, almost negligible in the sum total of operations.

This is far from saying, however, that the offensive functions of the aëroplane may not be so developed as to constitute a valuable factor. British aviators were reported to have done considerable harm to one or two German air-

ship stations, and even to have made two attacks in force, employing fleets of 34 and 40 aëroplanes, upon the German emplacements and depots near Ostend, with the purpose especially of destroying naval equipment and so defeating offensive preparations directed against English shores and commerce. Other examples are the reported (March 4, 1915) destruction of the German powder works at Rottweil, and the raid of 18 aëroplanes, May 27, 1915, on the German chemical factory at Ludwigshafen. Clearly such actions, if successful, would not be local in their results. It must not be forgotten that the subject is still in its infancy, that experience is lacking, even with the War in Europe, and particularly that the service of the aëroplane in reconnoissance has thus far so outweighed its possibilities in offense that these remain as yet undeveloped.

The announcement in 1911 of the Michelin prize for bomb-throwing contests led to some investigations of the problem of launching. P. Charbonnier, president of the Experimental Commission of Havre, published in the *Revue d'Artillerie* for December, 1911, the "Ballistics of the Aëroplane," in which he gave for a spherical projectile the elements of the trajectory *in vacuo* as well as tables of fire for both a vacuum and air. In the same number of the review just cited appeared a description of an aiming device, or sight, to be used by an aëroplane in flight. In the 1912 competition for the Michelin prizes Mr. Riley Scott, an American ex-officer of artillery (U. S. M. A., 1900), won both prizes, the first of 25,000 francs to the competitor who should from a height of 800 meters place out of 15 shots the greatest number of projectiles inside of a rectangle 140 by 20 meters, and the second of 50,000 francs to the competitor who from a height of 200 should place out of a series of 15 shots the greatest number in a circle of 10 meters radius. In the first contest Scott landed 8 out of 15 projectiles; in the second, 12 out of 15. He used an Astra-Wright biplane, at a speed of nearly a mile a minute. This was a very remarkable performance; it established beyond peradventure the fact that projectiles may be successfully launched from an aëroplane in flight with a more than satisfactory expectation of hits.

Scott's apparatus consisted essentially of two parts—the aiming device and the launching mechanism. The aiming device carries a telescope swung in gimbals by means of two concentric rings. In the launching mechanism the projectile rests in a sling one end of which is fixed to a crossbar of the inner ring, the other is held in position by an electromagnet and bolt. On the passage of the current this end of the strap is released and the projectile launched. It is best to discharge projectiles in pairs, as the equilibrium of the aëroplane thus remains unaffected; if desired, however, the apparatus may be so adjusted as to carry and release only one projectile at a time. The projectiles Scott used were ogival, with conical base, from the vertex of which projected a rod with three flanges, resembling the feathers of an arrow, and intended to keep the shot on the trajectory. Scott's apparatus is equally well adapted to the dirigible, but as it is possible for a dirigible to come to a stop in air, a special form of apparatus has also been devised for dropping projectiles vertically downward. This consists of a set of four tubes, each containing a projectile; the release is made by mechanical means.

Another apparatus (German) for launching bombs was Renaud's. Three discharge tubes, fixed at the vertices of an equilateral triangle, are mounted on a plate and receive the drop-shaped bombs; to these tubes are fitted covers containing a mechanism for holding the bomb in place. Each tube is worked by a pedal set in a board before the operator; by pressing on the proper pedal the corresponding tube is opened; upon disengaging the cover the discharging mechanism proper is set, and a fresh pressure on the pedal releases the bomb. It is claimed for the apparatus that it is safe, light, quickly assembled, and sure of action.

A special (English) projectile was held up by bolts fixed to the aëroplane frame and released by a hand lever. These bolts engage in the projectile in such a fashion as to constitute the safety device of the system; hence on release the projectile is automatically set to explode. The projectile has a tail rudder and carries the percussion apparatus in its nose. An aëroplane bomb developed in England, known as the Martin-Hale, could be hand dropped from an aëroplane or airship or fired from a spring gun. One variety of bomb carrying shrapnel had a total weight of 20 pounds. This includes an explosive charge of four pounds of trinitrotoluol and shrapnel consisting of 340 steel balls. Previous to dropping or firing the bomb the safety pin is withdrawn, and this leaves a tailpiece free to rotate under the action of the wind on the vanes.

Metal darts have appeared as weapons for discharge from the aëroplane. One of these, invented by a Frenchman named Guerre, was an incendiary arrow, 40 centimeters long, 8 centimeters in diameter, and weighing about one kilogram. It contains a reservoir holding about a quarter of a liter of gasoline, which is set on fire by the striking of the point; it is thus intended for the attack on hangars, supply depots, dirigibles, etc. Experiments made with this type seem to have been convincing, for it was reported that the French Minister of War had decided to supply these arrows to aëroplanes. Thanks to a safety device, they can be carried and handled with impunity. Other types are darts pure and simple, about 15 centimeters in diameter, made of steel, cannelured or flanged to keep them from tumbling. Dropped in showers from a considerable height it is conceivable that these darts might prove effective against troops or horses, but at best the results to be expected are aleatory.

The problem of aërial discharge will not be completely solved until certain difficulties inherent in the aëroplane itself shall have been overcome. For example, fuse setting may be a delicate operation aboard an aëroplane in flight. The nature of the fuse itself is an important matter; percussion fuses might be dangerous, especially in the case of a hard landing. One problem has already been solved. Since light projectiles are harmless, aëroplanes of special ascensional power have been built carrying projectiles weighing 100 pounds to 200 pounds and, according to French reports, successfully employed in May, 1915.

Armament of the Aëroplane. The question of arming an aëroplane with a machine or other gun presents itself under a twofold aspect. Material targets being here obviously out of

the question, such a gun would be used (*a*) against troops, (*b*) in combat against other air craft.

Against Troops.—No argument is needed to show that an opportunity, however fleeting, may present itself to an aviator to inflict considerable damage upon, e.g., a cavalry regiment, reserve troops in mass, or even upon a line engaged. But, as before remarked, such damage would be local and relatively unimportant. The real question turns on the possibility of so organizing aërial attack that a commanding general could send out a detachment or fleet of aëroplanes, just as he would a regiment or a brigade, to repel an attack or to make one itself. It would be rash to assert that an achievement of this sort were impossible; it is safer to say that unless aërial gunfire can be so organized it cannot be counted upon as a factor in the combat situation.

Combat between Air Craft.—The case is altered when we contemplate combat in the air between opposing aëroplanes and dirigibles. Here we may reasonably arm an aëroplane with a machine gun, such as the Lewis or the Benet-Mercie, in order to beat off or destroy a hostile aëroplane or to attack a dirigible. In fact, bearing in mind the great difficulty of reaching an aëroplane by fire from the surface of the ground, no other reasonably sure method presents itself of resisting a menacing aëroplane than to attack it with a machine of the same nature. To this end it must carry a suitable weapon and must expect to find its adversary similarly armed. A dirigible, to say nothing of the difference of bulk, owing to its slower flight and greater difficulty of manœuvring, would seem to be no match for an aëroplane carrying a machine gun and explosive projectiles. By remaining constantly above the level of the dirigible an aëroplane ought to be able to destroy it by bomb dropping; unless the dirigible itself carried guns upon its upper surface it could make no adequate answer to its smaller and more active antagonist. Apart from bombs, well-directed machine-gun fire delivered in the dirigible dead angles, if any exist, should put the airship out of commission. It is said, however, that the body of the dirigible has little to fear from machine-gun fire using small-arm ammunition. The 37-millimeter Hotchkiss is therefore mounted on some flying machines, and probably would prove effective. A totally different weapon is the Steinmetz "air-craft destroyer." This consists of a bomb at the end of a long wire let down just before the attack, which would consist in flying across and over the air craft to be destroyed, so as to cause the wire to bring up against it. As the flight continued the bomb would come in contact, "hook" itself in, and a suitable mechanism would cause it to explode. This device is recommended for the attack of dirigibles by night, and may even be used against hangars, depots, etc. The Germans, according to press reports, are dropping asphyxiating bombs from aëroplanes.

Upon the general subject of the tactics of air combat we must await the verdict of further experience. One point, however, would seem to be clear: since it is the business of an air scout to observe and report back, it would be his duty to avoid combat, just as a cavalry patrol may receive orders to avoid coming to blows with the enemy. Further, in future wars, aërial fleets will strive for the "command of the air," as sea fleets now strive for that of the seas. Symbolical of this strife is the air battle, March 21, 1915, between Lörrach and Mülhausen, in which 20 aëroplanes were engaged on both sides. This is regarded as the greatest aërial battle since the beginning of the war.

If an early conclusion from the War in Europe be permissible, it would seem that the offensive effect of an air attack, so far as measured by the known general situation, has, in marked contrast with the reconnoissance effect, been without any specially significant results. Air scouting, in the west at least, soon produced a state of virtual siege between the contending armies. No effect in the least comparable with this apparently can be attributed to air combat. But this conclusion is advanced with hesitation, because official reports later may bring to light instances of air attack of the greatest importance to the combatants concerned, instances perhaps immediately local, but attended with the greatest consequences.

The Attack of Air Craft.—With the development of air craft, whether dirigible or aëroplane, has come the development of weapons for their attack. Obviously the conditions are difficult. The target moves at high speed and the opportunities of aiming and firing are fleeting. The possibility afforded, in firing at a land target, of correcting for subsequent shots by observing the fall of the projectile, does not exist in firing at a target in the air, certainly not to the same degree. All ordinary weapons, the fieldpiece, the howitzer, the rifle, are well-nigh useless against air craft. The fieldpiece cannot be elevated, the howitzer fires (comparatively) slowly and its trajectory is curved. Both lack the facility of turning in azimuth, and the nature of the projectile used by them makes the observation of fire difficult. Rifle fire and machine-gun fire lack range; they might probably inflict no serious damage, even if the target were hit, and observation of results is practically impossible. Hence the necessity of providing special rapid-fire guns for the attack of air craft. These must have an all-around field of fire, be susceptible of elevating to at least 70 degrees, and admit of rapid changes of aim. Special ammunition must be provided, suited to the target and permitting the observation of the projectile during its flight. The fire itself must be carried on in a special manner. Ranging shots being out of the question, the only course is to use sweeping fire, based on the estimated or measured distance.

The calibre of balloon artillery depends on the conditions of service and varies from 3.7 centimeters to 12 centimeters. In a tactical point of view, i.e., to repel or destroy air craft threatening an army, whether by reconnoissance or by attack, great mobility is required. Hence the necessity of automobile mounts.

Various gun makers have addressed themselves to the business of making balloon-attack artillery intended to accompany an army in the field, to be mounted on shipboard and to be emplaced in coast fortifications. The guns manufactured by the Krupps are shown in the accompanying table, taken from Rasch and Hormel's *Taschenbuch der Luftflotten*, 1914.

The Rheinische Metallwaren- und Maschinenfabrik of Düsseldorf constructed 5-centimeter pieces on automobile mounts of two types—fully armored and half armored—besides other cali-

1. BRITISH HYDROPLANE. A Type Developed for the British Navy in the War.
2. GERMAN NAVY CENTRE-FLOAT ALBATROSS SEAPLANE. A Type Used in the War in Co-operation with Zeppelins for Coast Raids and Harassing Shipping.
3. BURGESS-DUNNE SEAPLANE.

TYPICAL WAR AËROPLANES MOUNTING MACHINE GUNS

1. BURGESS (AMERICAN) WAR PLANE, mounting Benét-Mercié automatic rifle on swinging crane giving 240 degrees arc of fire.

2. ARMORED DEPERDUSSIN (FRENCH) MONOPLANE, with aëro-mitrailleuse.

3. FRENCH ARMY SPECIAL TYPE ARMORED AËROPLANE, OR AVION, OF 1914, with Hotchkiss machine gun.

4. FRENCH ARMED AND ARMORED AËROPLANE. One of the machines assembled in 1914 to defend Paris from attack by Zeppelins. This is a Henri Farman biplane

bres ranging from 6.5 centimeters to 10.5 centimeters. The 6.5 had an automobile mount, as also the 7.5 half armored; another 7.5 had a field carriage, so constructed as to admit of elevation to 70 degrees and of depression to 5 degrees. The 10.5-centimeter had a so-called "firing carriage." At maximum elevation, the 5-centimeter will send their projectiles to a height of 3720 meters, the 6.5 to one of 7900 meters, the two 7.5 to 5860 and 6800 respectively, and the 10.5 to 8300. A special aëroplane machine gun was manufactured in England. This piece may be fired from the shoulder, like an ordinary rifle, or it may be mounted in the aëroplane itself. Schneider (France) made a balloon gun on an armored automobile mount, the Armstrongs one of 15.2 centimeter calibre. The (French) Deport air-craft gun can traverse 45 degrees on its carriage. Its trail is divided along its length, and the parts can be moved to the right and left respectively when in action.

	7.5 cm. fieldpiece L/30 on traversing carriage	7.1 cm. gun L/30 on automobile mount	7.5 cm. naval gun L/45 with shield	8.8 cm. naval gun L/35 without shield	8.8 cm. naval gun L/45 with shield	10.4 cm. coast gun L/45 with shield	12 cm. coast gun L/45 with shield
Calibre, centimeters	7.5	7.1	7.5	8.8	8.8	10.4	12
Length of bore in calibres	30	30	45	35	45	45	45
Weight of piece in firing position, kilograms	1,030	1,230	4,360	3,469	5,840	5,480	8,530
Weight of carriage, kilograms	1,700	...	...	...	...	...	...
Weight of shield, kilograms	...	...	940	...	2,400	780	1,080
Thickness of shield, millimeters	...	...	12	...	50/12	12	12
Limits of elevation, degrees	+65 −5	+75 −0	+70 −10	+80 −10	+60 −10	+60 −10	+60 −10
Limits of azimuth, degrees	360	360	360	360	360	360	360
Rapidity of fire, rounds per minute	...	...	25–30	20–25	20–25	15	10
Weight of projectile, kilograms	6.5	5	5.8	9.5	9.5	15.5	24
Muzzle velocity, meter seconds	510	650	800	800	800	800	800

THE 7.1 CM. L/30 AUTOMOBILE TRUCK

Weight of truck without gun	4,620 kilograms
Weight of truck with gun, without ammunition	5,850 kilograms
Weight of truck marching order, including detachment of six men	7,100 kilograms
Average speed per hour	45 kilometers
Greatest speed per hour	60 kilometers
Climbing power, slopes of	1:5

The Krupp balloon projectile is a double-chambered shell; the forward chamber carries the bursting charge, the rear chamber a smoke-producing composition. Should a hit be made, a suitable fuse operates to detonate the charge. The smoke composition burns during flight and emits smoke from apertures in the wall of the shell. The flight of the projectile may thus be followed and corrections made. The fuse is extraordinarily sensitive; it must act on meeting the slightest resistance, and yet be safe in the bore of the gun and during flight. The Düsseldorf company already mentioned supplied three types of projectiles for balloon attack—a *brisant* shrapnel, a smoke shrapnel, and a balloon shell. In the first of these a suitable charge drives forward the bullets and the head of the projectile. This head has its own bursting charge, intended to act about 125 meters ahead of the bullets. Should the head strike before bursting, a suitable fuse causes it to burst on impact. While the bullets go forward several hundred meters in a sharp cone of 12 to 14 degrees, the head sends its splinters with great violence, two or three hundred meters up, down, right and left, in a broad cone of 200 degrees. The smoke shrapnel carries a head filled with smoke composition; this leaves a visible track of smoke from the point of burst on, and to a certain extent thus permits of the correction of fire. The balloon shell carries a detonating charge, and behind this, smoke composition. At 250 meters before the intended point of burst smoke begins to issue and continues the same distance beyond this point. If in the meantime the shell should have failed to hit, a time fuse is set in operation and produces detonation; should this occur near the target, the flying fragments may hit and cause damage. The possibility of "mining" the air above fortifications against air-craft attack has been suggested. This plan would consist of sending up each evening a large number of small captive balloons to different heights to detonate either by judgment or on contact, each carrying a sufficient quantity of explosive to destroy any aëroplane or dirigible with which it might come in contact. These balloons may be supplemented by kites provided with long tails of malleable iron designed to foul the propellers of any air craft.

TYPES OF AËROPLANE

The division into monoplane and biplane does not of itself furnish a basis of military classification. Furthermore, whatever the basis, machines differ so much from one another in respect of form, size, and materials of construction as for the present to rob classification of any special usefulness. This question of type is not purely academic; apart from the importance of determining what type is best suited to the military service and what modifications it must undergo in order to adapt itself to varying conditions, it is clear that unity of type would greatly simplify repairs and replacements and the instruction and training of aviators. A step in the right direction would be so far as possible to adopt a standard system of control mechanism. So important is unity of type regarded by some authorities that it is asserted that 100 mediocre machines absolutely alike are better (in the military service) than 100 different models, however admirable each may be.

Since the sustaining power of an aëroplane varies with the square of its velocity, it is natural and logical that every effort should have been made to increase the velocity of its flight. Under these conditions the pilot's chief duty is to attend to his machine; it is therefore conceivable that his observations may be imperfect or inaccurate. As the aëroplane is above all other things an instrument of reconnoissance,

the military machine should therefore in the general case be at least two-seated—should carry an observer and a pilot. Further, since it is in the highest degree desirable if not essential that an observer should transmit his observations to headquarters as rapidly as possible, and without returning to his point of departure, we have to consider the possibility of adding still a third passenger charged with the dispatch of intelligence by wireless telegraphy or otherwise; and if, lastly, the aëroplane be offensively equipped, a fourth passenger must be taken on board to serve the gun or other engine of destruction. These conditions point to an aëroplane of great sustaining power.

On the other hand, the military situation may call for immediate information of a special character about a particular point. There is no question of destruction or of mapping but of special reconnoissance, e.g., the assistance of cavalry, the detection of hostile batteries, or the control of the fire of one's own batteries. What is needed is a trustworthy report by a trained observer, sent in or brought back with the utmost dispatch. Hence the one-seat machine, light, easily transported, driven preferably by a staff officer attached to headquarters. It may be found that for one class of duties the biplane, for the other the monoplane, is the better suited; but this is a matter to be determined by experience and one that in a military point of view does not necessarily affect the question of type. So far apparently we may recognize the high-speed machine, of small supporting surface, and a slower machine for duty, in which weight, rather than speed, is the feature to be considered; i.e., more specifically, we have the armored monoplane for cavalry and artillery reconnoissance, minimum speed 120 kilometers per hour; the armored biplane for general staff work, minimum speed 100 kilometers per hour; the armored biplane for purely offensive work, minimum speed 120 kilometers per hour; and finally, the large multiple-seated for special service requiring the coöperation of several passengers. In the United States the biplane has been favored for military purposes. As a matter of fact, all sorts of machines were and are found in the aëroplane fleets of the great military nations.

The conditions of the field-artillery service seem to require that aëroplanes should be permanently attached to this arm. In other words, the artillery feels that it should be emancipated from the necessity of calling upon the commanding general for aëroplanes when needed; that it should, on the contrary, possess and control its own machines, to be sent up at once when needed. And just as the needs of the military service call for the special assignment of flying machines, so should these, on account of the special duty they are called upon to perform, satisfy certain conditions.

In France the justice of the demands of the field artillery would seem to have been recognized; the plans for 1915 provided for the assignment of 20 squadrons (*escadrilles*) to assist the artillery. Similarly 10 squadrons were to be attached to the cavalry; provisional squadrons were indeed organized in 1914. A typical fighting biplane is the Vickers, designed for weight carrying and having a speed of 40 to 70 miles per hour. It is of the pusher type, built almost entirely of steel, and carries a small Vickers automatic gun covered in front by a hemispherical shield mounted on the barrel and moving with it; this shield has mica windows. The muzzle of the gun projects through the nose of the fuselage, which is entirely covered in. The arc of fire forward is 30 degrees on each side of the line of flight. Another English military machine is the "Mark R. E." (reconnoissance—experimental), said to be automatically stable, of the tractor type, and propelled by a four-bladed screw driven by a 120-horse-power Beardmore-Austro-Daimler motor. A French mount is the Loiseau for a Hotchkiss rapid-fire gun, on a support high enough to allow fire over the tractor even with considerable depression. The gun is protected by a 4-millimeter shield in front; although the gunner is partly covered by this arrangement, he is nevertheless seriously exposed. From a purely military point of view this mount is regarded as meeting the objections to the tractor type of aëroplane.

Nearly all military aëroplanes are of the tractor type, i.e., have the propeller, generally two-bladed, in front. The machine is thus pulled, not pushed, through the air. This special form of mounting is safer for the aviator, who in case of accident falls above the weights rather than under them. It has the disadvantage of limiting the field of fire forward.

The war machine has an inclosed body, or fuselage; this, however, is not necessarily a military feature. The Russian biplane "Russki Wijas" (1913–14) carried a deck house, affording complete shelter to the crew. The armored aëroplane was seen during the war in such examples as the French Dorand biplane (1914), the Nieuport monoplane (1914), and the Voisin biplane. The fuselage of the Dorand carried steel armor 2.5 millimeters thick, said to be proof against rifle fire beyond 750 meters, and in many models the armor protection covered the pilot, observer, provisions, instruments, and especially the propelling mechanism. It may be remarked that all machines not aggressive were fitted with wireless. Multiple screws are the exception; the vast majority of aëroplanes are single-screwed. One form of the Dorand armored biplane has twin screws, and so have the Nieuport, Dunne, and Savary biplanes; the Russian Sikorski biplane carries four screws in front, driven by four Argus motors of 100 horse power each. This aëroplane has a supporting surface of 125 square meters, with a speed of 28.20 meters and a length fore and aft of 20.20 meters —an indication perhaps of the enormous increase in size and power to be expected in the future. If very long, continuous flights are attempted, special tanks are provided for the gasoline carried, as in the Farman biplane (1914), supplied for a 24-hour flight. All aëroplanes of course carry instruments; among these are found an inclinometer, to give the angle of incidence of the machine, a clock, an aneroid barometer to measure the height, a speedometer, and a tachometer to give the revolutions per minute of the motor. In addition some good form of compass must be carried, as well as maps in a map case. These instruments, as need hardly be mentioned, are not peculiar to the military machine.

To mark the progress made in the evolution of the military aëroplane there follows an extract from the conditions governing the military aviation contest at San Diego, Cal., in October, 1914. The conditions bear date July 1, 1914, and, as before, were fixed by the United States Army Signal Corps.

"The type desired, namely, a military recon-

noissance aëroplane, must possess the following characteristics: biplane, inclosed fuselage, two-seated, dual control, and have a minimum speed of not less than 40 miles per hour when carrying fuel and oil for four hours' flight at 70 miles per hour and a useful load of 450 pounds, and under these conditions of load to climb 4000 feet in 10 minutes. The head resistance is to be kept down by avoiding unnecessary parts exposed to the wind and by using recognized stream lining for those parts necessarily exposed. The power plant is to be located in front of the occupants and suited to the requirements of the aëroplane. The motor must be capable of throttling to 20 per cent of full speed and running without overheating over the land. The motor must be supplied with a positive means of stopping by a short-circuiting device, by release of compression, or by other suitable means. It is desirable that the radiators, if used, should conform to stream-line requirements and act as an effective shelter for the motor. The motor should be provided with positively driven pump for pumping gasoline from the reservoir to the service tank and will also be provided with attachments for hooking on a flexible tachometer, the shaft for this purpose to come off the motor at right angles to the propeller shaft preferably downward. The propeller or propellers should be of sufficient form and construction and suited for the particular machine and possessing a minimum efficiency of 70 per cent, that is to say, to have a slip of not over 30 per cent. Wear and friction in the control leads must be eliminated in every possible way and the leads shall be as direct as possible. Leads to pitching and steering shall be in duplicate. The landing gear to be as strong and simple as possible to be efficient in absorbing shocks in landing and running at full speed over rough and plowed ground. The maximum gliding angle shall under no condition exceed 1 on 6, that is to say, one foot of drop for each six feet of advance. All parts shall be efficiently protected from the action of the weather by the use of suitable paint or furnished with covers. The power plant shall be so arranged as to be readily removed and replaced bodily without disturbing the alignment or the fastenings of the planes or landing gear. The machine complete shall be capable of being assembled from transportation cases in not to exceed two hours by four mechanicians and of being disassembled and packed in transportation cases in not more than one hour and a half by the same number of mechanicians. No part shall be of such length that when packed in its case the case shall exceed 20 feet in length."

Bibliography. In addition to the works listed in the bibliography under AËRONAUTICS there are available the following official reports and other works the range and number of which constantly are increasing: *Military Aviation*, April 26, 1912 (Washington, 1912); *United States Senate Report 1107*, Jan. 14, 1913 (ib., 1913); Committee on Military Affairs, *Aëronautics in the Army, House Report, 5304*, 1913 (ib., 1913); *Reports of the Chief Signal Officer*, U. S. A., especially 1914, and official reports generally (ib., 1914); R. P. Hearne, *Airships in Peace and War*, being the second edition of *Aërial Warfare* (New York, 1910); Grahame-White and Harper, *The Aëroplane in War* (Philadelphia, 1912); Bertrand, *Etat actuel de l'aéronautique militaire et navale* (Paris, 1913); Faroux and Bonnet (eds.), *Aéro-manuel*, 1914 (ib., annually); Rasch & Hormel (eds.), *Taschenbuch der Luftflotten*, 1914, 1915, the latter a war edition (Munich, annually); Hamel and Turner, *Flying* (London, 1914). All military journals and reviews contain articles on military aëronautics, e.g., the *Revue d'Artillerie* (Paris), *Army and Navy Journal* (New York), *United Service Magazine* (London), *Artilleristische Monatshefte* (Berlin). To give a list would be simply to name here the important military periodicals of the world. The general aëronautical periodical press (see article AËRONAUTICS) may be profitably consulted. In the technical though nonmilitary press, such as the *Scientific American* (New York), may also be found from time to time articles of value. See AËRONAUTICS; ARMY ORGANIZATION; MILITARY, OR MAN-RAISING, KITE; NAVAL AËRONAUTICS; RECONNOISSANCE; SIGNAL CORPS; STRATEGY; TACTICS; WAR IN EUROPE.

MILITARY ARCHITECTURE. The various branches of architecture concerned with the design and construction of buildings for distinctly military purposes. Until the early Middle Ages, military architecture consisted almost entirely of the building of strong walls, towers, and gates around cities and permanent camps. For the engineering of works of defense, see FORTIFICATION.

Egypt. The earliest completely fortified city in good preservation is El Kab in Egypt, which formed a parallelogram of about 1500 by 2000 feet. The walls were of brick, over 30 feet thick and less than 30 feet high, with gates only on two sides. There were no towers, no moats, and the gates were merely openings. Such walls have been found at Thebes, Heliopolis, and in many other cities. Egyptian engineers, however, were sufficiently skillful in the Middle Empire (2000 B.C.) to take advantage of the natural defensive features of rocky situations and to abandon the defective rectangular ground plan; this is evident at Kummeh and Semneh at the Second Cataract, built to protect Egypt from Nubian invasions. Crude brick was the material, projecting buttresses strengthened the walls at intervals, and there were stations where archers could protect the approaches; the wide moat which encircled the fort was defended by a low stone wall; the interior of the fort was filled up solid to the level of a chemin de ronde. The Hittite wars made the Egyptians acquainted with the far more advanced systems of western Asia. Towers, bastions, elaborately fortified gates, and the use of stone for brick were some of the results.

Western Asia. The use of crude brick has made impossible any detailed knowledge of the methods of fortification used in Babylonian cities, though they are known to have been protected by walls of immense thickness and height. The plan of placing the Royal Palace on one side and using it as a citadel, of rectangular shape, was followed by the Assyrians, as shown in the city of Sargon, near Nineveh. But it was in the more mountainous countries of western Asia, especially in Syria and Armenia, that the earliest really scientific types of military engineering were thought out. The rectangular type was abandoned in favor of the circular or ovoidal, by which the weak angles were entirely avoided. In place of a single wall with an advance wall or scarp, there were usually three concentric lines of increasing heights, each with towers and battlements and chemins

de ronde. The Hittite cities were the most famous of such fortifications, from which both the Egyptians and Assyrians learned much. The mountainous races of western Asia thus created a type that was long to remain the highest known to military architecture and to be perpetuated by the successors of Alexander, by the Byzantine emperors, and by the Crusaders.

Ægean Peoples. The Pelasgians and other Ægean peoples built also in stone, often with Cyclopean and polygonal masonry. There were many types: first, the groups of defensive forts on the outskirts, or constituting a citadel; then later, the walls encircling the entire city. This wall sometimes rises 60 to 70 feet; the citadel as much more. The walls of Tiryns, with chambers within their thickness, and the Lion Gate at Mycenæ, defended by a narrow passage or *dromos*, are especially famous.

Greek. The great majority of fortifications found in Greece belong to the prehistoric period just described, e.g., those in Acarnania, at Orchomenus and Phigalia. The advances made in later historic times are shown, e.g., at Mantineia, with two round towers protecting its double gate, and especially at Messene, with gates within large towers having a circular inner court. The towers are battlemented and are sometimes rectangular. Wherever a suitable rugged eminence permitted, a citadel was established, inclosed by walls and difficult of access, as at Athens. See CITADEL.

Roman. The walls of Pompeii, of Aosta, and of Rome are a few among many examples showing the use of a simple encircling wall. The walls of Aurelian around Rome show three tiers of defenses, two lines of embrasures opening on galleries, and the chemin de ronde behind the battlements, besides a fourth and higher line at the summit of the numerous square towers. A unique combination of camp, palace, and fortress was Diocletian's palace at Spalato, also a superb work of late Roman architecture, with heavily projecting circular and rectangular towers.

Byzantine. The Eastern Empire continued the traditions of the ancient Orient. Antioch, Edessa, Constantinople, Amida, and other great cities trace their genealogy from Alexander's successors to Justinian. The essay of Procopius on the fortresses of Justinian shows how the Byzantine science of fortification was then being revolutionized under this Oriental influence, as in the great works at Dara. Between the towers permanent échauguettes and machicoulis, hurdles, or overhanging galleries, were built—originally of wood, but then of stone, in order better to let missiles fall on the besiegers. The system of several concentric walls triumphed permanently over the single rectangular Roman circuit. The citadel was not, as with the Romans, placed in the centre, but in touch with one of the outer walls, so that, if the city were taken, communication could still be maintained between the citadel and the outside world. Their system was adopted throughout the Empire and even in Europe, under Justinian. The walls of Constantinople, though in ruins, still exist—both the land walls and a part of the seaward defenses.

Mohammedan. In the great wars with the Byzantine Empire the Arabs quickly learned the science of military engineering, especially after the titanic struggle with the Macedonian dynasty in the ninth and tenth centuries. Syria, Mesopotamia, Armenia, and Asia Minor are still covered with the ruins of forts, castles, and fortified cities of this period. The triple-walled citadel of Cairo was erected by architects from Syria. When the Crusaders came to the East, they came into contact with these two forms of Oriental engineering and borrowed its ideas for the West. The golden age of military works in the Orient extended from the ninth to the twelfth century. The combination of citadel and palace, which did not originate in Europe until the fourteenth century, was then a common thing with the emirs of the Mohammedan world; many such castles, of which the Granada Alhambra is an example, are still found in ruins—sumptuously beautiful within, magnificently strong without. The Seven Towers at Constantinople and the two castles of Hissar on the Bosporus represent the highest development by the Turks of Byzantine models (fifteenth century).

Mediæval Europe. With the barbarian invasions of the fifth and sixth centuries there had been a veritable fury of haste to fortify the cities throughout the Roman world. This was particularly noticeable in Gaul, e.g., at Grenoble and Vienne, and in Spain, as at Cartagena. Mediæval cities often—as at Carcassonne—have their later fortifications based on late Roman or Gothic prototypes. But ordinarily the Roman fortification was a *castrum*, which did not inclose the city. City defense seems to have remained at a higher level than feudal castle architecture until the twelfth century, for while castles long remained mere earthworks in the north of Europe, cities had stone walls and even, as at Piacenza, two concentric circuits; and while the castle keeps were rectangular and in the centre of the circuit, the citadels were often curvilinear and astride the outer walls. For a well-preserved fortified city the best example is Carcassonne in southern France, built during the twelfth and thirteenth centuries. It has an inner and an outer circuit with towers of several shapes, bastions, and barbicans, with a magnificent citadel on the west edge. Avignon, Cologne, Cracow, Aigues-Mortes, Lucerne, Rothenburg, and Nuremberg have more or less complete mediæval fortifications, mostly of somewhat later date.

In the thirteenth and especially the fourteenth and fifteenth centuries in Europe æsthetic beauty was to an eminent degree united with military science in the design of fortress castles. This transformation is exemplified by such structures as Vajda-Hunyad Castle in Hungary, Marienburg in Prussia, and the ducal castle of Milan. The rebuilt castle of Pierrefonds in France carries this conception to its utmost limit. The city gates, as at Lübeck, Cologne, Tangermünde, Stendal, became works of municipal decoration as well as defense. A like combination of art and science was practiced during the Renaissance in Italy: accomplished artist architects like San Michele, San Gallo, and Michelangelo were employed to design fortifications and city gates; e.g., the Porta Nuova, Porta del Palio, etc., at Verona, the Porto del Lido at Venice, the fortifications of San Miniato, etc. After the seventeenth century the work of the architect was more and more severed from that of the engineer. Architecture as distinguished from military engineering at the present day is confined to the designing

of barracks, storehouses, stables, workshops, hospitals, and other buildings required for military purposes but not in themselves defensive. See BARBICAN; BASTION; BASTILLE; CASTLE; CITADEL; DONJON; EMBRASURE; FORTIFICATION; GATEWAY; PORTCULLIS; POSTERN; WALLS; and bibliographies under FORTIFICATION and CASTLE.

MILITARY BAGGAGE. See BAGGAGE, MILITARY.

MILITARY BRIDGES. See BRIDGES AND DOCKS, MILITARY.

MILITARY COMMISSIONS. Special military courts created during the occupation of conquered territory, for the trial of offenses which cannot by the rules of war be tried or punished by courts-martial, and yet which are not within the jurisdiction of any existing court. A military commission, unlike a court-martial, is exclusively a war court. It may be legally convened and assume jurisdiction only in time of war or when the civil authority is suspended on account of the existence of martial law or military government. The powers and procedure of this class of military tribunals have not been defined by statute law nor have they even been expressly authorized by any act of Congress, although they have repeatedly been recognized by the legislative, executive, and judicial departments of the government. According to usage the same rules which apply in the organization and procedures of courts-martial are held to be applicable to military commissions, and their proceedings are subject to review in the same manner and by the same authority as courts-martial. Certain offenses which in time of peace are regarded as civil offenses become in time of war military offenses and are triable by military commission, even though the civil courts may be open and in the unobstructed discharge of their duties. During the Civil War and Reconstruction periods capital offenses were frequently tried by military commissions and the parties punished, although they were in neither the military nor the naval service and in spite of the constitutional provision that all persons held for capital or otherwise infamous crimes, except when arising in the land or naval service, shall be tried by jury. Consult S. V. Benet, *Treatise on Military Law and the Practice of Courts-Martial* (6th ed., New York, 1868), and W. E. Birkhimer, *Military Government and Martial Law* (2d rev. ed., Kansas City, 1905). See COURTS, MILITARY; MILLIGAN, EX PARTE; MILITARY LAW.

MILITARY COURTS. See COURTS, MILITARY.

MILITARY EDUCATION. The education of the modern military officer may be divided into two parts, the preparatory and the technical. The increased demands made upon him in the exercise of his profession entail a most exacting and comprehensive preliminary training—so much so that in many countries candidates for army commissions are trained from earliest youth and molded mentally and physically for their future career. Below is a review of the systems of military education as practiced in Europe and the United States.

In **Austria** army training for cadets begins between the ages of 14 and 17, there being a number of schools (Realschulen) set apart for that work. Of these the greatest number are for the infantry, then the remainder for artillery, cavalry, and pioneers respectively. On graduation cadets are taken into the army as cadet officer substitutes (*Cadet-offizier-stellvertreter*) and granted commissions according to seniority, each selecting his own regiment or corps in the branch to which he is assigned—subject to the approval of the officers of such regiment or corps. In addition to these schools there are four military preparatory schools, a military orphanage, and the upper military school, whose pupils, sons of officers without means, enter the academy of Wiener-Neustadt, with its three years' course for cavalry and infantry officers, and the Technical Academy of Vienna, with a similar course for artillery and engineer officers. Pupils unfitted for the courses of these academies go to the cadet schools (Realschulen). Pupils capable of passing the entrance examination of the academies may enter direct. German is the language used in all military educational establishments, the curriculum also being based on the German system. For officers there are at Vienna the war school (staff college) and the superior artillery and engineer schools.

Belgium, previous to the great war, trained the officers of all arms at the Ecole Militaire, Ixelles, the course covering a period of two years for infantry and cavalry and four for artillery and engineers. Entrance is gained by competitive examination, there being an average of 80 vacancies in the school each year.

England possesses two military educational institutions: the Royal Military Academy at Woolwich, which is set apart for Royal Engineers and Royal Artillery cadets; and the Royal Military College at Sandhurst for cavalry and infantry cadets. No one is allowed to compete who has not been passed by the Army Council as socially qualified to hold a commission. The entrance examinations are conducted under the supervision of the Civil Service Commissioners, and there is also a rigid physical examination. The age of admission is from 17 to 19½ years for Sandhurst, and from 16½ to 19½ years for Woolwich, successful candidates paying half-yearly fees, the amount of which varies with the status, official or otherwise, of their families. At Woolwich the period of instruction covers two years and is divided into four classes, of which the fourth is the junior. The third and fourth classes are educated together, but on passing out of the third class into the second, the cadets are separated into two divisions, engineers and artillery, where they remain until graduation. Those passing out of the third class with the best percentage of marks go to the engineers, and the remainder to the artillery. Once the assignment has been made to any particular division a transfer is never allowed. The Royal Military College at Sandhurst is confined to cadets for cavalry and infantry, the entrance examination, fees, and academic terms being similar to the Royal Military Academy. A few cadets are received as royal cadets, or India cadets, who enter without payment and receive a small allowance. They are usually specially favored sons of poor or distinguished officers or have served as court pages. The course of instruction extends over a period of 18 months, divided into three terms, or classes of six months each, known as junior, intermediate, and senior. The peculiarity of the British method of instruction, compared with that of all other countries, is the brief period of instruction in the schools and the very exacting competitive standard and examination for admission, which, as well as the expense

involved at the very outset, limits the class from which cadets are drawn.

Schools of application are the Royal Engineers' at Chatham, the School of Gunnery at Shoeburyness, the Artillery College at Woolwich, the School of Musketry at Hythe, and the Staff College at Camberley. The Army Medical School at Netley trains candidates for appointment in the Royal Army Medical Corps. For schools for rank and file, see ARMY SCHOOLS.

France has two celebrated Cadet schools: (*a*) The Polytechnique at Paris, founded in 1794, supplies not only officers of artillery and of engineers, but also officials of the scientific branches of the government, such as roads and bridges, mines, naval construction, etc.; (*b*) the Ecole Spéciale Militaire, founded in 1808 at Saint-Cyr, and hence popularly called Saint-Cyr, whose graduates enter the cavalry and infantry. Entrance is by competitive examination, and candidates must, on the first of January of the year of examination, be between 17 and 21 years of age. The course lasts two years. Under a law passed in 1905, candidates who have passed must serve one year in the ranks under exactly the same conditions as a private soldier. At the end of this year they enter the schools. This law is due to the democratizing tendencies of the French Republic and, inasmuch as in principle one-half of the officers come from the ranks, rests on the supposed necessity of *unity of origin* for all officers. The artillery school at Fontainebleau has two divisions, one preparing noncommissioned officers of artillery to become officers of that arm, the other of postgraduate studies for lieutenants of artillery. At Versailles are found the same arrangements for the engineers. The school of the train is attached to the artillery school. At Saumur is the postgraduate school for officers of cavalry, as well as a school for noncommissioned officers of cavalry, candidates for commissions. The corresponding school for noncommissioned officers of infantry is situated at Saint-Maixent, but, unlike the other arms, there is no postgraduate school for the infantry.

The Ecole Supérieure de Guerre (Superior War School), or staff college, at Paris receives, after examination, officers of at least five years' service for a thorough course in strategy, tactics, military history and policy, and other subjects relating to the conduct of war. Other schools are those of military administration, of the medical service, etc.

Germany. Officers of the German Army come from the Kriegsschulen (war schools), of which there are 11 in the Empire. All candidates for commissions, whatever their origin, must, after having been appointed Porte-épée Fähnrich, be graduated from one of these schools. The Porte-épée Fähnrich, in turn, are composed of two classes, avantageurs and cadets, and must satisfy certain conditions before being appointed, such as passing the examinations of the Central Board of Officers at Berlin, have served at least five months as private, etc. Avantageurs are young men who announce themselves as candidates for commissions; most of the officers come from this class, the remainder from the cadets, who are pupils of the 10 cadet schools. To these schools boys are admitted at 11 years of age; they remain until they are 15, when they are transferred to the Cadetten Hauptschule (principal cadet school) at Gross Lichterfelde near Berlin.

The course at the Kriegsschulen lasts 35 weeks and is so adjusted that four classes are graduated in three years. Officers of foot artillery and of pioneers pass to the artillery and engineer schools of application (Berlin and Münich). The Technical War Academy completes the training of officers in mathematics, mechanics, physics, chemistry, and engineering, in the application of these sciences in general, and in their special application to the military service. This academy is open to lieutenants of all arms, and the course lasts three years. There are three riding schools (Hanover, Dresden, and Münich); as the purpose of these schools is the development of equitation and horse training, they are hardly to be regarded as educational in the usual sense of the word.

Finally we have the Kriegs Akademie, or General Staff School, at Berlin. The purpose of this school is, through its course of superior military instruction, to disseminate in the army a knowledge of the higher questions of strategy and tactics, and of military policy as an element of national policy. Secondarily this school serves to train officers for the staff. There is an entrance examination open to all officers of at least three years' service in a commissioned grade. The professors are drawn as a rule from the officers of the great general staff. There are no examinations, but very careful notes are kept of the progress, capacity, and ability of each student officer. These are sent at the close of the three years' course to the chief of the general staff, who makes them the basis of selection of officers to serve a detail in the great general staff. Munich has a similar academy.

Italy. Military schools in Italy are divided into three classes: (1) the college militari, or preparatory schools; (2) the military academies at Turin for engineers and artillery, and at Modena for infantry and cavalry; (3) scuole militari complementari (schools of application). The Scuola di Guerra, the school of application for artillery and engineer officers, is at Turin, and the cavalry school is at Pinerola. The courses of instruction at the military academies of Turin and Modena are three years and two years respectively. There is a school for underofficers at Caserta, where approved noncommissioned officers are educated for commission. In each arm of the service fully one-third of the commissions are held by men from the ranks.

Japan. The military academies of Japan compare very favorably with the best in Europe, being in effect organized, as is the army, on the German model. There are establishments devoted to military education under the Minister of War, including the school of military music and the various schools of application. In 1902 several parties of Chinese army officers were sent by their government to undergo a course of instruction at the Japanese Military Academy.

Russia draws most of her officers of cavalry and infantry from cadet (*younker*) schools, of which there are a number in the Empire. Officers not coming from these schools are furnished by the military schools and by the corps of pages. Staff instruction is given at the Nicolas (Staff), technical artillery training at the Michael (artillery), technical engineer training at the Nicolas (engineer) academies respectively, all at Petrograd. The military law and the military medical academies are also situated at Petrograd.

Spain educates her infantry cadets at Toledo, cavalry at Valladolid, engineers at Guadalajara, artillery at Segovia, and administrative at Avila. Suitable academies have been established at these respective places.

United States. Military education in the United States is practically a university system, bringing as it does all the different branches of military education into one system and under the direct control and supervision of a body of specially qualified officers, making every part of the system effective. The United States Military Academy at West Point, N. Y. (see MILITARY ACADEMY, UNITED STATES), is the foundation of the entire system and is generally conceded to be unequaled in the thoroughness and comprehensiveness of its training. The practical education of the cadet, in its broadest sense, begins with his assignment to his regiment or corps, there being in addition an officers' school at each military post for elementary instruction in theory and practice. The special service schools or schools of application are: (*a*) the Coast Artillery School at Fort Monroe, Va., which has a division for enlisted men; (*b*) the Engineer School, Washington Barracks, D. C.; (*c*) the Mounted Service School, Fort Riley, Kans.; (*d*) the Army Medical School, Washington, D. C.; (*e*) the army service schools at Fort Leavenworth, Kans., comprising (1) the Army School of the Line, (2) the Army Staff College, (3) the Army Signal School, (4) the Army Field Engineer School, (5) the Army Field Service and Correspondence School for Medical Officers; (*f*) the Army War College (q.v.) at Washington Barracks, D. C. To these may be added the School of Musketry and the School of Fire for Field Artillery, both at Fort Sill, Okla., and the Aviation School at San Diego, Cal. A general supervision of all the different schools enumerated above is exercised by the general staff. Officers' schools at military posts, the army service schools, and the Coast Artillery School are open to National Guard and volunteer officers, as well as to graduates of military schools and colleges which have had regular army officers as instructors. Military education is also furnished by certain State and private schools and by the "Students' Military Instruction Camp." (For other schools, see ARMY SCHOOLS.) Information in respect of military schools must usually be sought in official publications. For the United States, consult especially I. L. Reeves, *Military Education in the United States* (Burlington, 1914).

MILITARY ENGAGEMENT. See BATTLE; ENGAGEMENT; STRATEGY; TACTICS, MILITARY.

MILITARY ENGINEERING. See ENGINEERING, MILITARY.

MILITARY EVOLUTIONS. See EVOLUTIONS, MILITARY.

MILITARY FACINGS. See FACINGS, MILITARY.

MILITARY FRONTIER. See FRONTIER, MILITARY; MILITARY GEOGRAPHY.

MILITARY GEOGRAPHY. Geography is that branch of science which deals with the phenomena of the earth's surface. Military geography considers these phenomena in their relation to or as they influence the practice of the military art in each of its four subdivisions of strategy, tactics, logistics, and military engineering. Although military geography is concerned principally with natural physical features and resources (physical geography) as modified artificially by man (topography), the statesman and soldier must also study the influence of political, historical, and commercial geography in so far as such influence is felt in national military policies. The knowledge gained from these studies is essential to the formulation of effective strategic plans designed with a view to realizing a particular national policy. The study of the geography and topography of possible theatres of war in the vicinity of political frontiers or boundaries develops a knowledge of military frontiers, i.e., those lines of positions naturally or artificially made strong in a military sense. These lines are usually located near, but are seldom coincident with, political boundaries.

Influence of Geography on Military Operations. In making a general preliminary study of a country with a view to analyzing former campaigns or preparing a plan for future military operations it is advantageous first to consider the great rivers. This has been well expressed and explained by Brigadier General May (*An Introduction to Military Geography*, London, 1909) in the following words: "In studying the military geography of a country we cannot do better than follow up the path of its great watercourses. We are soon in touch with questions of vegetation, of crops, of the distribution of domestic animals, with villages, towns, great cities, fortresses. We reach them by *communications*, and the story of a nation's struggles and growth hinges upon these. For communications govern supply, and supply governs war."

The details of the physical features of the theatre of war must be thoroughly studied beforehand in order to arrive at the character of the troops best suited to that terrain. The means of transportation also is determined by the character of the roads and trails forming the line of communications. In an open plains country with good roads a preponderance of mounted troops and wheeled transportation might be advantageous; in a rough, mountainous country only dismounted troops and mountain artillery, transported on mule back, might be possible. Great howitzers sufficiently mobile on the roads of continental Europe might be useless on American roads. Thus, calibre and power of artillery may be fixed by geography and topography.

The nature and quantity of food, fuel (including petroleum), and forage afforded by the country to be traversed; how the additional amounts required for great modern armies are to be obtained from their own or neutral countries; and by what lines of communication, sea or land, such supplies are to be transported to the main, intermediate, and advance bases—all these are questions of the greatest moment to the responsible statesmen and generals, and they all must be answered, in part, in geographical terms. Thus, physical geography, by giving a knowledge of the resources of all countries, and commercial geography, by affording a familiarity with all the sea lines of communication, are of the utmost value to these national leaders who foresee the inevitable conflicts resulting from national expansion.

Physical geography also treats of weather, climate, and seasons, and these directly affect military operations, both strategic and tactical, as well as questions of supply of food, clothing,

shelter, and transportation. To safeguard the health and comfort of men and animals on tropical service special precautions must be taken. A knowledge of the tropics is essential if proper preparations are to be made. The American campaign of Santiago in 1898 is an illustration of the almost disastrous loss of efficiency due to an inadequate appreciation of the difficulties of tropical service.

The influence of mountains on the strategy and tactics of the attack and defense has many historical instances. Opinions differ as to the relative value of a mountain chain to the offense and to the defense. But the attacker, if he knows his terrain, has the great advantage of being able to select the particular pass to be forced and of concentrating a superiority of numbers at this point before the defender, with difficult lateral communications, can concentrate his troops. The Alps were crossed by Hannibal, Francis I, and Napoleon. The Pyrenees have been crossed frequently by large armies. Alexander in his great march to India led his armies across mountain ranges which would try the skill and endurance of modern soldiers. Jackson in his valley campaign skillfully utilized the mountains as a screen and obstacle to a hostile attack on his flank in his advance paralleling the general trend of the Massanuttons.

Valleys, being the line of least resistance, determine the line of advance, communication, and supply. He who holds the valleys holds the country. Railroads follow the valleys, just as ancient military roads and trails followed the watercourses. It is for this reason that the modern general finds it useful to study the geography of ancient campaigns, the historical routes of barbarian invasion. In going from Constantinople to Vienna the modern traveler to-day passes over the Roman route by way of Adrianople, Philippopolis, Sofia, Belgrade, and Budapest.

Great valleys usually carry great rivers. Rivers may form obstacles, as in the case of mountain ranges, or they may be the principal lines of communication and supply when navigable. They often become the military or strategic frontiers, the defended passages of which form the crucial points during a campaign. Though offering serious difficulties as obstacles, they may be successfully crossed, as are mountain ranges, when the will and skill exist. The Danube, one of the greatest military barriers, has been crossed more than 20 times in the face of defending forces.

A river may guard the flank of an army advancing along its course or may determine the direction of march on account of water supply. Rivers must be studied with reference to strategical points and as a means of supply. The bridges, ferries, fords, roads to each; current, nature and height of banks, floods and ice conditions, must all be considered before military operations are undertaken. Although rivers form natural boundaries and effective military frontiers, it is noticeable in Europe that the expansion and contraction of states in the past has in most cases resulted in the elimination of rivers as political boundaries. Junctions of rivers may form important strategical points or keys, as they control the intersecting valleys and require a besieging army to advance with forces separated by the intersecting rivers.

In planning military operations it is always necessary to study the geography of the theatre of operations with a view to selecting definite objectives, called strategical points, against which the operations are to be conducted. Such objectives may be political, commercial, or purely military, or all three. The objective, whenever practicable, should be so situated that an advance against it will surely threaten the principal line of communication and supply of the defending army. Examples of such points are important river crossings, mountain passes, railway centres, capitals, water supply, a river port controlling access to the sea and to the interior, etc.

Sea power determines the ultimate eminence of a nation politically, and the development of such power is largely due to geographical location and conditions in relation to the sea. Great Britain's frontier is the sea, and her national existence in peace and war depends on sea trade and sea control. The materials for shipbuilding, coal, and iron are near her great seaports, which control the trade routes through the English Channel to the North and Baltic seas. Similarly, a geographical study of Japan's location and relation to the shores of the Pacific will give an insight into her aspirations and probable future development as the great sea power of the Pacific. For a complete understanding of the political and military history of any country—Germany, Russia, France, Spain, Italy, Holland, the United States—or their present international policies, we must study their geographical location with respect to the sea and the sea routes to other lands.

A knowledge of natural features as modified by man with harbor improvements, wharves, communication to the interior by river, canal, or rail are of utmost importance in planning combined operations of the army and navy. The great interoceanic canals, Panama and Suez, and their approaches introduced new policies and modified strategic plans. The attack and defense of a great seaport like New York involves a knowledge not only of harbor channels, but also (which is far more important) a detailed study of all adjacent landing beaches, tide, surf, prevailing winds, character of beach, lines of advance to the rear of the city and its coast defenses, and the natural positions for interior land fortifications to resist an assault from the rear.

The importance of lines of communication cannot be overestimated. In the words of General May, "Success or failure in war ultimately hinges on communications. That side which can stay the longest—that is to say, which continues to be fed and supplied and reënforced with regularity—will at length emerge victorious. Communications spell strategy, and it is generalship or strategy that wins wars, though it is possible for courage and skill at arms to win battles, or even campaigns."

Above we have touched upon the vital importance of the control of the high seas. On land one of the most striking developments of modern war has been the increased efficiency of railways. During the Russo-Japanese War (1904–05) it was freely predicted that Russia would fail because of the insufficiency and inefficiency of her means of communication by a single line of rail 5000 miles from Moscow. As a matter of fact Russia was able to assemble and maintain at a distance of 5000 miles from her base a force of over 1,000,000 men, a force which was but little less than that of Japan,

who was only six days by sea from her base. Strategical railways are being rapidly constructed not only in continental Europe, but in both Asia and Africa. It was to such railways constructed by Germany in time of peace that she owed her wonderful mobilization on both the western and eastern fronts in the Great European War of 1914. Her six main lines of railway to the French frontier, and those built to the frontiers of Belgium and Luxemburg, double-tracked and equipped with the most modern landing platforms and sidings, joined together by railways paralleling the front along the Rhine, enabled Germany to transport, with great rapidity, vast armies to any part of the French and Belgian frontier and to reënforce any threatened point by troops from any other point. On the Russian side Germany had 17 lines (23 tracks) leading to the frontier, by means of which she was able to dispatch 500 troop trains per day. Against these 17 lines Russia had only five. From Austria eight lines (10 tracks), with a capacity of 260 trains per day, run into the intrenched camps of Galicia, from which an advance into Russia may be made. Against these the Russians have only four lines of railway. Since 1905 the Carpathian Mountains have been pierced by five lines of railway and preparations made to lay three more. To these strategic railways was due the ease with which Germany carried the war into the enemy's territory and placed both France and Russia on the defensive at the very outbreak of the war.

Napoleon once said that "the frontiers of states are either large rivers or chains of mountains or deserts. Of all these obstacles to the march of an army the most difficult to overcome is the desert; mountains come next, and broad rivers occupy the third place." Since his day, however, modern railroad engineering has eliminated the terrors of deserts in Asia, Africa, and America, and thus compelled new policies and new strategic plans of offense and defense.

An article on military geography, no matter how brief, would be incomplete without some reference to buffer states, protectorates, and spheres of influence. Such terms designate the territory of weak states declared inviolate by the mutual agreement of stronger neighbors. Sometimes the purpose is to provide against aggression, sometimes to conceal preparations for aggression. In any case the weaker neutralized state is at the mercy of one or all the stronger. Switzerland, surrounded by France, Germany, Austria, and Italy, is an example of the geographical location of a neutral state influencing the strategy of her neighbors. Belgium, the cockpit of Europe, is an illustration of a buffer state used as the battleground for stronger neighbors. Luxemburg has a similar history. Afghanistan is a true buffer state between the Indian Empire of England and Russia.

The fundamental cause of war is national expansion, which means a forcible rearrangement of international boundaries. A study of the geography of frontiers is therefore most valuable to statesmen responsible for policy as well as to soldiers charged with the execution of policy. For these reasons we find that military geography is largely concerned with the subject of military frontiers—those selected and strengthened lines of defense established in the vicinity of international boundaries as a bulwark against aggressive neighbors. Under modern conditions of war permanent fortifications constitute a minor part of frontier defense, the main reliance being placed on mobile field armies, for the movement of which in war there have been prepared in peace ample lines of communication leading to the national boundary, and lateral communications, connecting these, parallel to the general front. There is given below as examples a brief geographical outline of a few military frontiers as they existed at the outbreak of the European War in 1914. By reference to a suitable map there will be noted the location of the military frontier, and its rail and other communications, with reference to the international boundary protected.

France. Northern frontier, from Dunkirk to Longwy, 220 miles. Fortified towns: Calais, Gravelines, Dunkirk, Bergues, Lille, Douai, Maubeuge, Mézières, Montmédy, Longwy. Between these are other fortified places, and behind this front a second line: Péronne, Arras, Laon, La Fère. Eastern frontier, from Longwy to Delle, 240 miles. The line of defense extends from Mézières through Verdun, Toul, Epinal to Belfort. Verdun is a fortress of the first class and is on the direct road from Metz to Paris. Between the places given are many minor fortifications. Behind this front is a second line: Rheims, Langres. Still further to the rear is Paris, with its circle of fortifications.

Germany. Here we find a different and more modern principle of defense, noticeably in the absence of fortifications. The Vosges Mountains on the boundary constitute a natural military frontier or obstacle. The only great fortifications are the entrenched camps of Metz and Strassburg. Behind these flows the Rhine, a natural obstacle with guarded passages and a railway on each bank for lateral communication along the front. There is a second line with a few strongholds: Mainz, Coblenz, Cologne, New Breisach, Diedenhofen, Bitsch, and Rastatt. Berlin, unlike Paris, is not defended by great fortifications. Germany's frontier dispositions foretold what the European War of 1914 proved, viz., that the defense of her territory would be accomplished by promptly assuming the initiative and carrying the fight into Belgium and France. On the northeast front there are important fortifications: Danzig, Thorn, Gaudenz, Dirschau. To the northeast of Danzig the strong fortress of Königsberg, with its adjacent strong places at Pillau and Memel, and Boyen near Lötzen. West of Thorn is Bromberg and to the southwest Posen, with strong places. Since the Oder offers an easy advance to Berlin, the fortifications at Glougau have been constructed. Still farther to the south is Neisse.

Bibliography. For other European military frontiers and the geographical reasons for their selection and fortification, consult May, *An Introduction to Military Geography* (London, 1909). On account of the past isolation of the United States with respect to great military powers there is but little published technical literature on the subject of its four great frontiers—the Atlantic, the Pacific, the Canadian, and the Mexican. Expert technical studies have been made by officers of the general staff, but the records of these studies are to be found only among the confidential records of the War College at Washington. However, an interesting geographical military study of the Pacific coast, by a civilian, is to be found in Homer Lea's *Valor of Ignorance* (New York, 1909). A read-

ing of this book will suggest the absorbing interest and great value of geographical studies in relation to general national and military policies.

Consult also: T. M. Maguire, *Military Geography* (New York, 1900); James, *Modern Strategy* (London, 1904); Lyde and Ferryman, *Military Geography of the Balkan Peninsula* (New York, 1905); A. C. Macdonnell, *Outlines of Military Geography* (2 vols., London, 1911); United States Army Service School Press, *Moltke's Correspondence* (Fort Leavenworth, Kans., 1911).

MILITARY GOVERNMENT. The administration of territory taken from the enemy which is authorized under martial law (q.v.). It is under this power, arising from the necessity of the case, that provisional governments are instituted in conquered territory. All proceedings of government under martial law are, within the scope of their authority, as legal and constitutional as any other military proceedings. Military government is more properly applied only to governments established in territory outside the boundaries of the state to which the troops establishing it belong. Military rule established in disturbed areas of a state to which the force establishing it belong is more properly to be termed martial law (q.v.).

MILITARY HONORS. Compliments paid to certain officers, officials, or other distinguished persons. See SALUTES; HONORS, MILITARY.

MILITARY HOSPITALS. See HOSPITAL.

MILITARY HYGIENE. See HYGIENE, *Military Hygiene.*

MILITARY INSIGNIA. Devices used to distinguish the various corps, branches, ranks, and grades of the military and naval services. In all the armies of the world it has been found necessary to employ badges and devices to mark the necessary distinctions incident to such organizations. The term "insignia" is here employed to include such badges, devices, etc., in contradistinction to equipment, clothing, etc. The custom in Europe is a natural result of the evolution of the various countries both politically and militantly, and in the case of England particularly the badges, mottoes, and devices used by the various regiments are emblematic of conspicuous incidents in their history and not infrequently have been taken in battle from some regiment of the enemy.

Commencing with the insignia distinguishing the various grades of rank, German usage may be described at length, seeing that its system in a large measure obtains in every other army in Europe. Throughout the Imperial army the epaulets of all commissioned ranks are crescent-shaped. The various grades are distinguished as follows: 1. General field marshal, two batons (staffs of command crosswise over each other). 2. General in chief, three stars. 3. General of the infantry, cavalry, or artillery, colonel, captain, two stars. 4. Lieutenant general, lieutenant colonel, first lieutenant, one star; major generals, majors, and second lieutenants do not wear a star. Second and first lieutenants and captain wear epaulets having a gold rim but no trimming; colonels, lieutenant colonels, and majors wear epaulets with gold rims and silver trimming. The general field marshal, general in chief, lieutenant general, and major general are distinguished by the silver rims and silver trimming of the epaulets. The noncommissioned ranks are distinguished by the gold or silver lace on the collars, cuffs, and facings of the tunics. On the shoulder straps is the number of the soldier and the monogram of his regiment. The various arms of the service are also distinguished by the color of the tunic lace; e.g., infantry regiments have red lace. On the right side of every German soldier's helmet is placed the black, white, and red cockade of the German Empire, while the cockade on the left side indicates the particular state of the German Confederation to which the regiment belongs, as follows: Prussia, black-white; Bavaria, white-sky blue; Hamburg-Bremen-Lubeck, white with red cross; Saxony, white-green, Württemberg, black-red; Baden, yellow-red; Hesse, white-red; Mecklenburg, sky blue-yellow-red; Oldenburg, white-dark blue with red cross; Saxe-Weimar, yellow-green; Brunswick, sky blue-yellow; Anhalt, green; Saxon duchies, green-white; Lippe, yellow-red; Schaumburg-Lippe, white-red; Waldeck, yellow-red; Schwarzburg-Sondershausen, white-dark blue; Schwarzburg-Rudolstadt, dark blue-white; Reuss, yellow-red. Other distinguishing marks between the various services of the German army are found in the color of their uniform, for which see UNIFORMS, MILITARY.

In the British army insignia play an important part. They are used as much to encourage esprit de corps as a mark of distinction between regiments. There is a large degree of variety in the badges in use among the various regiments of the army, most of them reminiscent of stirring periods in regimental history. In 1836 the King commanded that an account should be published concerning the insignia, badges, devices, etc., of the regiments of the army, together with the particulars recounting the reasons for their existence. The result was a very excellent history of the British army. The introduction of the territorial system in 1881 destroyed in a measure the individuality of the regiment and made it a part of the territorial district to which it was assigned. In the effort to bind still further the regiment and its district together the attempt was made by the military administration to abolish many of the insignia formerly characteristic of the different regiments. The attempt, however, created so much opposition and ill will among all ranks of the army that a compromise was effected, and to-day nearly all the old devices are employed, the expense usually being borne by the officers of the regiment. The authorized and unauthorized badges include the royal arms (in the case of the guards and all other regiments distinguished by the prefix "royal"), the whole or part of numerous orders, and other royal honors. Still others are purely regimental, i.e., badges distinguishing regiments of the same arm, as castles, arms of counties and cities, the Prussian eagle, the French eagle, the death's head, the elephant, the antelope, tiger, dragon of Wales, dragon of China, the sphinx of Egypt (this is worn by the 30 regiments who served in the first English expedition against the French in Egypt), the Paschal Lamb, the white horse of Hanover, the white horse of Kent, the lion of England, a gun, a grenade, the bugle (all light infantry and rifle regiments are distinguished by this badge), the bear and ragged staff, the figure of Britannia, St. George and the dragon, the harp and crown, the shamrock (as in the case of the newly formed Irish guards), the Scottish thistle, the Cross of St. Andrew, and many others. The royal arms are borne by the Royal

Engineers and the Royal Artillery, the difference between them being in the mottoes, *Quo Fas et Gloria ducunt* and *Ubique*. With the latter motto is coupled an artillery gun.

As with Germany, the various branches, arms, departments, etc., of the service are distinguished by their distinctive uniforms and not by any particular badge. In the mounted branches rough riders (or young horsemen) are distinguished by a spur worn above the elbow on the sleeve of the tunic; farriers and shoeing smiths wear a horseshoe. Expert swordsmen and gymnasium instructors of all branches wear the crossed swords. Marksmen (sharpshooters) of all arms wear the crossed guns placed immediately above the cuff of the tunic. Pioneers wear the crossed axes on the upper sleeve. Commissioned and noncommissioned ranks of the infantry wear the sash, which in the case of officers is of silk and is worn over the left shoulder, and with noncommissioned officers is of worsted and worn over the right shoulder. Scottish Highland regiments are further distinguished by the differences in pattern of their clan tartans. See Uniforms, Military.

In the United States at the time of the Revolution the distinguishing characteristics of army ranks were largely copied after French, Prussian, and English usages. General and staff officers were distinguished by the color of their sash or ribbon, which was worn over the waistcoat and under the coat. Cockades were worn by all other commissioned officers, and the noncommissioned officers were distinguished by the color of their epaulet. On June 18, 1780, a general order was promulgated authorizing the following insignia of rank and grade: major generals to wear two stars on each epaulet; brigadier generals, one star; field officers wore two epaulets; captains, one epaulet on the right shoulder only; lieutenants, one epaulet on the left shoulder. Other distinguishing marks were details of uniform. In 1782 the system of wearing stripes as badges of rank and service by the rank and file was instituted. Changes were frequent up to the Civil War, but the insignia since that time have remained substantially the same, the more important changes, particularly those of 1902, having had to do with uniform and equipment rather than with insignia. Officers' insignia (1914) are as follows:

(*a*) The letters U. S., of Gothic design, made of gold or gilt metal or dull-finish bronze, worn on the collar of the dress, service, or white coat, are placed at a distance of 1 inch from each end of the collar. When worn upon the dress or white uniform, the letters are of gold or gilt metal (of silver for Engineers). When worn upon the service uniform, they are of dull bronze metal. To designate officers of volunteers these letters are followed by the letter V.

(*b*) The insignia of corps, department, or arm of service are as follows: General Staff Corps, the United States coat of arms, of gold and enamel, superimposed on a silver star; Adjutant General's Department, a shield 1 inch high, ¾ inch wide; Inspector General's Department, gold or gilt sword and fasces crossed and wreathed; Judge-Advocate-General's Department, sword and pen in gold or gilt metal, crossed and wreathed; Quartermaster's Department, sword and key crossed on a wheel, surmounted by a spread eagle of gold or gilt metal, platinum and enamel; Medical Corps, a caduceus of gold or gilt metal; Medical Reserve Corps, same with letters R. C.; Dental Surgeon, same with letters D. C.; Acting Dental Surgeon, D. S., the caduceus of silver; Corps of Engineers, a silver turreted castle; Ordnance Department, shell and flame, of gold or gilt metal; Signal Corps, two crossed signal flags and a burning torch, in gold and silver; chief of the Bureau of Insular Affairs, seven arrows with wings on sides, 1 inch high, in gold or gilt metal; professors and associate professors of the United States Military Academy, shield and helmet surrounded by a scroll, in gold or gilt metal; aids-de-camp, a device 1⅓ inches high, consisting of a shield of the United States, of properly colored enamel ¾ inch high and ¾ inch wide at top, surmounted by a gold or gilt eagle, with wings displayed, on blue field of the shield a star or stars, according to rank of the general on whose staff the officer is serving. This device is worn on the collar in lieu of corps or line device.

The devices appropriate to the various arms of the service are as follows: Cavalry, two crossed sabres, 1 inch high, with number of regiment above intersection; of gold or gilt metal. Field Artillery, two crossed field guns, design to be 1 inch high, of gold or gilt metal, the number of the regiment ⅜ inch high in the upper angle. Coast Artillery, two crossed cannon, with oval at centre carrying a projectile, point up. Infantry, two crossed rifles, design to be 1 inch high, with number of regiment above intersection; of gold or gilt metal. Regimental adjutants, quartermasters, commissaries, and artillery district adjutants wear in the lower angles of their insignia the devices (of gold or gilt metal) of the respective departments to which their duties correspond; the battalion adjutant and quartermaster of engineer battalions wear the same devices above the centre turret. Chaplains, the same as for regimental staff officers, except that the pendant design is a Latin cross of the same material and size. The insignia of corps, department, or arm of service is placed upon the collar of the dress, service, and white coat ⅝ inch from the letters U. S. and is of gold or gilt metal with the dress or white uniform and of dull bronze metal with the service uniform. Veterinarian, device of arm of service, with foot of a horse in lower angle, number of regiment in upper angle.

(*c*) The insignia of rank are placed on the shoulder loops of the service coat and the white coat near the shoulder seam, also on the shoulder knots, as follows: General, coat of arms of United States between two stars; lieutenant general, one large star between two small stars; major general, two silver stars; brigadier general, one silver star; colonel, one silver spread eagle; lieutenant colonel, one silver leaf; major, one gold leaf; captain, two silver bars; first lieutenant, one silver bar.

Sleeve insignia of rank: major general, two silver stars; brigadier general, one silver star; colonel, a single knot composed of five strands of gold-wire lace, not exceeding ⅛ inch in width, applied to the sleeve of the full-dress coat below the elbow, the base resting on the gold band of the sleeve; lieutenant colonel, four strands, single knot; major, three strands, single knot; captain, two strands, single knot; first lieutenant, one strand, single knot; second lieutenant, without gold lace; chaplain, without gold lace. The outside dimensions of the gold-lace insignia are the same for all officers, the dimensions being made by taking strands from the interior. Metal

insignia of corps, department, arm of service, or aid-de-camp are placed in the centre of the open space under the lace insignia, except for general staff officers, who wear the corps insignia on the shoulder knot.

Sleeve insignia for overcoats, made of flat black mohair soutache braid ⅛ inch in width, follow the form of the gold-lace insignia for dress coats, but are applied with the base resting at lower end of the sleeve. Insignia of corps, etc., are not worn on the overcoat.

Epaulets: for general officers, of gold with solid crescent, the devices being the coat of arms of the United States embroidered in gold, and one star for brigadier general, two for major general. For general staff officers the insignia of the corps replace the coat of arms of the United States.

Shoulder knots: of gold-wire cord ¼ inch in diameter, formed of three cords in four plaits and rounded top, finished with small gilt regulation button; about 5½ inches long and 2½ inches wide, extending from the seam of the sleeve to the seam of the collar; slightly stiffened with a flexible backing which is covered with cloth of the color of the coat and made detachable; insignia of rank to be worn on knot.

Shoulder straps are as follows: general—dark-blue cloth, 1⅝ inches wide and 4 inches long, bordered with an embroidery of gold ⅜ inch wide; the field of strap to be of cloth the color of the facings of corps, department, or arm of service; the insignia of rank to be placed in field of strap as follows: general—two silver-embroidered stars of five rays each and gold-embroidered arms of the United States; lieutenant general—three silver stars. Major general—the same as for a lieutenant general, except that there are two stars instead of three; the centre of each star to be 1 inch from the outer edge of the gold embroidery on the ends of the straps; both stars of the same size. Brigadier general—the same as for a major general, except that there is one star instead of two at the centre of the strap. Colonel—the same as for a brigadier general, omitting the star, with a silver-embroidered spread eagle on the centre of the strap. Lieutenant colonel—the same as for a colonel, according to corps, department, or arm of service, omitting the eagle, with a silver-embroidered leaf at each end, each leaf extending ⅞ inch from the end of the strap. Major—the same as for a lieutenant colonel, with a gold-embroidered leaf at each end, instead of silver leaf; each leaf extending ⅞ inch from the end of the strap. Captain—the same as for a major, omitting the leaves; at each end two silver-embroidered bars of the same width as the border, placed parallel to the ends of the strap; the distance between them and the border equal to the width of the border. First lieutenant—the same as for a captain; at each end one silver-embroidered bar of the same width as the border, placed parallel to the ends of the strap, at a distance from the border equal to the width of the border. Second lieutenant—the same as for a first lieutenant, omitting the bars. Additional second lieutenant—the same as for a second lieutenant. Chaplain—of dark-blue cloth of the usual size and pattern, with a plain Latin cross of silver in the centre.

Corps badges were first employed during the Civil War and proved to be an extremely valuable means of identification. The devices employed include a triangle (Fourth Army Corps); the star and crescent (Seventh); a six-pointed star (Eighth); an acorn (Fourteenth); an arrow (Seventeenth); a maltese cross (Nineteenth); a shield (Twenty-third). The device for Wilson's cavalry corps consisted of crossed swords surmounted by a carbine. The Signal Corps was distinguished by the crossed flags and torch. Division headquarters were marked by a square flag upon which was a badge designating the character of the headquarters. The old Twentieth Corps did not at first wear a badge, but when the new Twentieth was formed by the consolidation of the Eleventh and Twelfth Army Corps, it adopted the badge of the Twelfth, a five-pointed star. During the Spanish-American War the various corps were distinguished by the following corps badges: Artillery Corps, crossed conical projectiles, with round shot above the centre; Cavalry Corps, a winged horse's foot; First Corps, the letter I inclosed in a circle; Second Corps, a four-leaf clover; Third Corps, a three-toothed clutch; Fourth Corps, a caltrop; Fifth Corps, a five-bastioned fort; Sixth Corps, a six-spoke hub; Seventh Corps, a seven-pointed star; Eighth Corps, two overlapping circles, very much resembling the figure eight; Ninth Corps, a nine-toothed buzz saw; Tenth Corps, two triangles point to point; Eleventh Corps, same design as for the Tenth Corps, with the addition of a horizontal bar through the centre; Twelfth Corps, a square with a clover leaf at each corner; Thirteenth Corps, a palm leaf; Fourteenth Corps, a square with half circles on each side; Fifteenth Corps, a bugle; Sixteenth Corps, a spearhead; Seventeenth Corps, a battle-ax; Eighteenth Corps, an arch. The color of the symbol determined the division of the corps, as: red, First Division; white, Second Division; blue, Third Division. Such badges were worn on the hat or cap. Commissioned officers wore them on the left breast and not on the hat. See UNIFORMS, MILITARY AND NAVAL; AIGUILLETTES; CHEVRONS; ETC.

MILITARY JUSTICE, BUREAU OF. See MILITARY LAW.

MILITARY, or **MAN-RAISING, KITE.** The man-raising kite as employed for military observation is in principle a "captive" or "anchored" aëroplane (see AËRONAUTICS) in equilibrium under the action of three forces, the weight of the apparatus, the pressure of the wind, and the tension of the retaining cable. It is a military possibility because it is easily transported, may be used in a high wind, is quickly sent up, is safe, cheap, and easily repaired. Although of exceedingly limited application, it may yet, under special conditions, be of great value.

The possibility of using a kite for observation purposes is comparatively recent. Various models have appeared from time to time: Maillot's octagonal kite in 1886; Baden-Powell's hexagonal in 1894; Lamson's superposed planes in 1896; diedral kites, etc. But its serious practicability is due chiefly to the invention by Hargrave of the cellular or box kite. This consists essentially of two canvas parallelepipedons, presenting to the wind a double surface, one sustaining, the other directing; in reality it is a canvas beam, open at the ends and cut away in the middle. In the construction of the kite the important condition is to have a maximum sustaining surface and a minimum weight, without sacrificing the strength, the resistance of the system. Hence we have the so-called *density of*

the kite, the ratio of its weight to its bearing surface. Having the box kite then, the true solution of the problem was obtained when the idea of *trains* of kites suggested itself. By the application of this idea not only was the supporting power of the system increased, but its safety also; should one of the trains give way, the others would still hold. Observation from a kite is very convenient and safe; should the wind show signs of falling, the kite is hauled down. A squall even is not to be feared. It is noteworthy that the cable is but slightly influenced by changes of position of the kite in a gusty wind, and remains always stretched in the same direction, that of the prevailing wind. Hence the steadiness of the car, a valuable quality, especially if photographs are to be taken. Moreover, the observer is reasonably safe even under fire, for his stay in the air need be but brief; in other words, he may make his observations and come down before the enemy can get the range.

It is obvious that the possibilities of the man-raising kite are limited; it may, of course, accompany an army in the field, but cannot hope to compete with the dirigible and the aëroplane. Its chief application will be made in observing siege and fortress artillery fire; but even in these cases it will prove inferior to the captive or kite balloon. For one thing, in a given wind a kite will rise to a certain height, which it is useless to endeavor to exceed; any further attempt merely causes the kite to displace itself in the direction of the wind. According to one authority, Captain Saconney, of the French army, the useful limit of cable payed out is reached when the height of the car is equal to half the length of the cable unwound.

Two countries have made a specialty of the kite: Russia, in its navy chiefly, England in both army and navy. It is said that in England ascensions of 400 meters and even of 800 meters have been made. The results achieved excited attention in France; the outcome of the investigations and experiments was the Saconney apparatus, of which we shall here give a brief description. In this apparatus two cables are used; to one is attached a train of kites, called the principal train, the purpose of which is merely to raise its cable in the air. On this aërial rail, thus supported, runs a trolley, from which hangs the observation car, carried up by a second train of kites; the car is controlled by the second cable. The two cables are operated by a double winch driven by the motor of the automobile truck that transports the equipment when dismounted. This winch can take up cable at the rate of 180 meters per minute; should the principal train give way, this speed sets up a relative wind, sufficiently great to prevent accidents. The supporting cable is 5 millimeters in diameter, 1500 meters long, and has a resistance of 2000 kilograms; the car cable above the car is 5 millimeters in diameter, with a resistance of 2000 kilograms, and 3.5 millimeters below the car, with a resistance of 1000 kilograms; it is 1300 meters long.

The number of kites to be used obviously depends on the velocity of the wind that may be blowing at the moment. It is assumed that the traction of the cable is constant; this traction corresponds to a lifting effort of 300 kilograms sufficient to support the car, the observer, and the cable. This is always unwound to the same length, and its weight therefore does not change. The "independent variable" of the problem is consequently the velocity of the wind to be determined by observation; the "dependent variable" is the number of kites. This number is determined as follows: 10 kites of 100 meters' bearing surface will in a wind of 10 miles produce the normal lifting effort of 300 kilograms. This rule is known as the "rule of 10." Modifications of the normal case are assumed to vary with the square of the ratio of wind velocities. Hence a wind of 5 meters per second will support only 75 kilograms, and to raise 300 kilograms, 40 kites will be needed, an impracticable result. A wind of 20 meters per second, on the contrary, would support 1200 kilograms; hence three kites would suffice. The importance of the number of kites appears when we consider that, if the number remained always the same, the stress of the system would be increased ninefold for an increase of the wind velocity from 8 meters per second to 24 meters per second.

The kite used is the Hargrave model, fitted with wings; the car is a wicker basket one meter deep. (See KITE for illustration and description.) In operation two methods of launching the system are followed: the first is known as that of "successive postillions," in which the pilot kite is sent up to say 100 meters, and the others are then successively attached and allowed to run up until they come against the stops, about 6 meters apart; these stops increase in size with the distance, as do the split rings by which each kite is slipped on to the cable. The cable is then paid out. If the wind is strong, the pilot is sent up to its full height, then in succession the remaining kites. In the second method the whole apparatus (with the pilot) is set up on the surface of the ground, ready for launching; at the word of command the pilot is released and takes up the system. The first method requires only a limited space, 30 meters long, the second a space 10 times as long. The complete operation may be carried out in 20 minutes by a crew of some training. Transportation is furnished by an automobile pulling a baggage wagon and carrying besides the crew of 16 men. Apparatus and automobile cost about $3000, as compared with $12,000 to $15,000 for an aëroplane and $500,000 for a dirigible. Communication is had with the ground either by visual signals or by telephone. For further details, consult *Revue d'Artillerie* (Paris, August, 1912). See KITE; MILITARY AËRONAUTICS.

MILITARY LAW. That part of the law of the land which prescribes and enforces the public obligations of persons in the military service. The civil law not being adequate for the government of the military community, peculiar laws and institutions have been framed for its regulation, which invest military authority with the right to punish offenders who are under military rule for offenses contrary to military discipline, or breaches of military duty, the essential object being to maintain order and discipline in the army. Every country that maintains a standing army generally enacts articles for its government and confers special and limited powers upon the military authorities to enable them to enforce their provisions.

The Constitution of the United States confided to Congress the power to keep up a standing army and to make rules and regulations for its government. Under this grant Congress has

enacted Articles of War and other similar enactments which together constitute the statutory military law of the United States. These statutes deal not only with military offenses and punishments, but also with the constitution, composition, jurisdiction, and procedure of military courts. The power of the President to issue regulations and orders to the army is a right incidental to his constitutional power as commander in chief and is a means for carrying into execution his sovereign power. Such orders of the President, as commander in chief, and of superior officers, when not in conflict with existing law and regulations, are also a part of the code military. To declare what the law for the army shall be is the province of Congress; but to interpret this law is a judicial function. While American military law is mostly statutory, we must go to the decisions of the courts and to the opinions of the attorneys-general for interpretation and explanation of the enacted word.

Customs of the Service in peace and in war are a source of military law. These usages have become to the army a kind of common law, supplementing the statute law and regulations. The oath administered to the members of a court-martial requires them in doubtful cases to administer justice according to "the customs of war in like cases." This oath is almost identical with the one taken by members of courts-martial in the British service, and the term "custom of war" as used in the Articles of War of the United States must not be understood as referring only to the usages of the army of the United States.

Persons Subject to the Military Law are (1) officers and soldiers on the active list, whether militia or others, mustered and in pay of the United States, (2) retired officers and soldiers, (3) persons who fraudulently enlist and receive pay and allowances thereunder, (4) discharged officers and soldiers who have defrauded the United States, (5) discharged officers after summary dismissal and general prisoners. In time of war spies, retainers to the camp, persons who relieve and aid the enemy in the way specified in the statutes, are included. When a person subject to military law commits an offense he is placed in arrest or confinement. Except in cases of quarrels, frays, and disorders commanding officers have power only to put officers in arrest. An officer arrested confines himself to his quarters until his arrest is made open or its limits extended. He is not permitted to wear a sword or to visit officially his commanding or superior officer, unless directed to do so. Whenever a commanding officer places an officer in arrest and releases him without preferring charges he makes a written report to the department commander of the cause. When an officer is put in arrest for the purpose of trial, except at remote stations, the officer ordering the arrest must see that he has a copy of the charges on which he is to be tried within eight days after his arrest. Noncommissioned officers and privates to be tried by summary court are generally placed in arrest in their quarters. Privates to be tried by general court-martial are confined in the guardhouse. Confinement without trial as a punishment for an offense is forbidden. Consequent upon arrest follows a preliminary investigation as to the crime or offense charged against the prisoner and the evidence upon which it is to be supported. If the offense is one for trial by a superior court, the charges are forwarded by the commanding officer with the statement that he has investigated them, and his opinion as to whether or not they can be sustained. When an offense is a minor one a soldier may be given punishment by extra fatigue duty, restriction of privileges, etc., provided he consents to accept such punishment in lieu of trial.

Certain various offenses against military law when committed in time of war are punishable with death. In time of peace the ordinary punishments are dishonorable discharge, confinement at hard labor, and forfeiture of pay. The maximum punishment is given only when the offense is of the worst type or when an example is necessary. In a few instances the punishments are mandatory. The purposes of military process and proceedings in respect to offenses against military law have reference always to the prevention in future of the commission of these offenses. In the military code of England prominence is given to the principle of honor, and as the life of the military community will always depend on the zealous maintenance of this professional characteristic, one of the most important purposes for which the military law exists is to preserve the honor and purity of the service.

American military law began with the War of the Revolution. Articles of war were first made for the government of the army on June 30, 1775. In April, 1806, the present military code was established. This code was derived immediately from the English military laws, and for many years the American officer was compelled to look to English treatises on military law to solve questions which arose in the course of his judicial duties. In 1864 a military law department was established by Congress, to be known as the Bureau of Military Justice. In 1883 this bureau was consolidated with the corps of the judge advocates of the army under the title of Judge Advocates Department, which it still retains. This department as now organized consists of a judge-advocate-general and 12 judge advocates, holding permanent commissions in the department. These judge advocates are stationed in time of peace at the headquarters of the several military departments into which the country is divided. In time of war they are at the headquarters of armies, field armies, and divisions. They are consultative officers and legal advisers. In important trials the direct responsibility of their prosecution is upon them. They receive and revise the proceedings of courts-martial held in their several departments, give legal opinions, and administer oaths. In the English army a judge advocate never acts as a prosecutor or witness for the prosecution. He is a helper to the court, and the prosecutor and the prisoner are entitled to his opinion on any point of law that is relevant to the trial. The judge-advocate-general is a member of Parliament, a Privy Councilor, and a responsible adviser to the crown in all cases of general courts-martial which the crown confirms.

Military law requires that before a sentence of a court can be executed it must be confirmed. In England the sentences of general courts-martial are confirmed by the King or by an officer holding a warrant from the King. In the United States the officer ordering the court or the officer commanding for the time being must approve a sentence before it can be executed. Except in certain convictions in time of war a sentence of death must be confirmed by the President. In time of peace no sentence of a court-martial di-

recting the dismissal of an officer can be executed until approved by the President. It is the duty of a confirming officer to see that the finding and sentence are legal and that the latter does not award a punishment in excess of the punishment authorized by law. Where the sentence of a court-martial imposes several punishments one or more may be approved.

The principal offenses committed by soldiers are desertion, fraudulent enlistment, disobedience to superiors, quitting or sleeping on post, drunkenness, absence without leave, selling or losing by neglect clothing or equipment, and miscellaneous offenses to the prejudice of good order and military discipline. A person in the military service is not freed from his civil obligations. He is still a citizen and amenable to the civil authority for violation of local laws. He is liable to be taxed for his real estate or household goods. He may vote at the place where he has a legal residence.

French Military Law is administered by means of regular trial and sentence before a military tribunal or by infliction by any superior or inferior punishments for mere faults. The punishments inflicted upon officers for faults against discipline are: simple arrests, rigorous arrests, reprimand from the colonel, and prison. Faults of officers too grave for disciplinary punishment are referred to courts of inquest. Councils of war, answering to the American general court-martial, take cognizance of the graver violations of military law, which can only be punished by afflictive or infamous punishments. The judgments of councils of war may be revised by councils of revision. If the latter annul the judgment referred to them, proceedings and decision are sent to a second council of war having jurisdiction in cases of judgments annulled by councils of revision. There is also a court of appeal in cases of trial and sentence for the crime of capitulation. This court is styled the Court of Cassation. Punishments in the German, Austrian, and Russian armies are similar to those in the French service.

English Military Law so nearly resembles the American as to require in this article but brief description. It is embodied in the Army Act of 1881 and is kept in operation from year to year by the passing of the Army Annual Act. It consists of a written and unwritten part. 1. The written part consists of the Army Act, rules of procedure, King's Regulations, general orders, army circulars and orders, royal warrants, and orders in council. 2. The unwritten part consists of the laws or customs of war. The sovereign has power to make articles of war, but the articles of war and the Mutiny Act have been consolidated in the Army Annual Act, and it is doubtful if the necessity for articles of war will ever arise again. The military code of England describes in detail the serious offenses against military law and prescribes the maximum punishment that can be awarded for them.

Consult: W. W. Winthrop, *Military Law and Precedents* (2d ed., Boston, 1896); W. E. Birkhimer, *Military Government and Martial Law* (2d rev. ed., Kansas City, 1905); G. B. Davis, *Treatise on the Military Law of the United States* (New York, 1908); *Manual for Courts-Martial*, prepared by direction of the Secretary of War for the use of the army of the United States (Washington, 1910); S. C. Pratt, *Military Law* (8th ed., London, 1911). See COURTS, MILITARY; MARTIAL LAW.

MILITARY MUSIC. See BAND, MILITARY.

MILITARY OATHS. See OATHS, MILITARY.

MILITARY ORDER OF FOREIGN WARS. See FOREIGN WARS, MILITARY ORDER OF.

MILITARY POLICE. In European countries, the name given to that branch of the police force which has military as well as civil constabulary duties. In these countries the force exists in peace as well as in war. In the United States, in time of peace, there is no regular Federal military police, but they are organized as required during campaigns and during manœuvres simulating war. Selected men for such a force are detached from the army. Their status and duties are defined in the *Field Service Regulations, United States Army* (1914). The duty of military police is to enforce all police regulations in the theatre of operations and in mobilization and concentration camps. They protect the inhabitants of the country from pillage and violence and prevent excesses of all kinds, keep all roads clear, arrest all soldiers and civilian employees absent without proper authority, arrest all marauders, and collect all stragglers and hand them over to their organizations. They keep a list and description of all camp retainers and followers and watch their conduct. They take charge of all prisoners of war. They police all railroad stations, public houses, depots, and public buildings, protect telegraph and telephone lines and railways from damage, keep hostile inhabitants in order, disarm them, and prevent spying. All persons in the military service are required to assist the police when called upon to do so. Officers and enlisted men when actually performing the duty of military police wear a blue brassard on the left arm bearing the letters M. P. in white.

Although there are no Federal military police in the United States in time of peace, the State of Pennsylvania has maintained a State military mounted police force since 1909. It consists of about 300 selected men, many of them with prior service in the regular army, organized into four troops, with officers, under command of a major. The force is composed of experienced men, well paid, mounted, and armed. They guard an area of about 4500 square miles in western Pennsylvania and have proved far more successful than the local police and militia in arresting offenders and in preventing looting, disorder, and crime in time of strikes, floods, fires, and other disasters. In 1915 efforts were being made to secure a similar force for the State of New York.

A noted military police is the Royal Northwest Mounted Police of Canada. This force was organized in 1873 by the Dominion government to preserve law and order in the wilderness northwest of Lake Superior. Before the Great War of 1914 this force consisted of 55 officers and 708 selected men, distributed as follows: Alberta, 290; Saskatchewan, 390; New Manitoba (the northern and sparsely settled part), 22; Northwest Territories, 12; Yukon Territory, 49. In the summer of 1914 the force was increased by 500 men, owing to the fear of possible unrest and disorder among the 175,000 Germans and Austrians settled in the various provinces and districts patrolled by the police.

In the British army, in England, the military police consists of mounted and dismounted branches, with headquarters at Aldershot (q.v.). Their duties are similar to those of the civil police, but are confined to the soldiers of the

district in which they are stationed. In time of peace they are scattered in detachments of varying strength throughout the standing camps and large garrisons of England and Ireland. They are recruited from the regular army and are confined exclusively to noncommissioned officers and men of several years' service and unblemished record. Every member of the force is a noncommissioned officer and acts with the full authority of such. Their uniform is similar to that of the field artillery. In France similar duties are performed by the gendarmerie, a force of military police recruited from the army, but performing civil duties in time of peace. There is a legion in each army corps region, and some regions have more than one legion. The total strength is about 21,700 men, of whom about half are mounted. It is proposed to create a mobile gendarmerie, to deal with strikes and riots, so as to avoid the necessity for calling out troops on such occasions. The Garde Republicaine is also a police force and performs duties in Paris similar to those performed by the gendarmerie in the departments. Its strength is nearly 3000, of which about 800 are mounted. The military police of Germany come into active employment during war time, when each army corps mobilizes two detachments, one to accompany the corps itself and one for the line of communications. In their colonies the Germans, in addition to troops, usually maintain a military native police force officered by Germans. Police forces organized on a semimilitary basis exist throughout the British Empire. The crown colony of Hongkong has a semimilitary police force of 1173 men, of whom 164 are European, 462 Indians, and 547 Chinese. The Royal Irish Constabulary was organized in 1822 and at the present time consists of about 10,000 officers and men. This organization is famous for its efficiency and loyalty during many trying periods of Irish history. Similar bodies were organized throughout Australia, for duty in the gold-mining camps primarily and afterward to control the natives and protect isolated ranches or stations. In organization there is generally a colonel, lieutenant colonel, or major at the head, who is in turn responsible to the Minister of the Interior. Rank and title are the same as in the regular army. In South Africa the South African Mounted Riflemen, established April 1, 1913, are available for military duties whenever required and are included in the military defenses of the colony. The Nyasaland Protectorate (British Central Africa) employs a military police. They are under British officers and are charged with the duties of maintaining order and suppressing the slave traffic. The area under their jurisdiction covers 39,315 square miles and is divided into 14 districts. They also police the eastern portion of the British South Africa Chartered Company's territory, north of the Zambezi, for which they receive payment. British East Africa, besides a military force, has a police of 1735 men under 38 European officers and noncommissioned officers. The Rhodesian military police forces now include all the small bodies of men formerly engaged in the division of what is now termed Rhodesia, the corps as a whole being under the High Commissioner, as are also the forces of the Bechuanaland Protectorate and Basutoland. Similar forces were maintained throughout the German possessions in East and Southwest Africa. See PROVOST MARSHAL.

MILITARY PRISON. By law the government and control of the United States Military Prison is vested, under the Secretary of War, in the Board of Commissioners of the United States Soldiers Home, and the president of that board is required to submit to the Secretary of War annually a statement of the financial and other affairs of the prison. The board consists of the Surgeon-General, the Quartermaster-General, the Chief of Engineers, the Judge-Advocate-General, and the Governor of the Soldiers Home. The immediate administration is in the hands of army officers detailed for that duty by the Secretary of War. The United States Military Prison is divided into three branches: United States Military Prison, Fort Leavenworth, Kans.; Pacific Branch, Alcatraz Island, San Francisco harbor; Atlantic Branch, Fort Jay, Governors Island, N. Y. In addition to these prisons there are guardhouses at military posts in which general prisoners may be temporarily confined. In the United States army there are several classes of prisoners. They are designated as follows: enlisted men against whom charges have been preferred are designated as "awaiting trial"; those tried and prior to promulgation of result as "awaiting result of trial"; those serving sentences of confinement, not involving dishonorable discharge, "garrison prisoners"; officers or men sentenced to dismissal or dishonorable discharge and to terms of confinement at military posts or elsewhere as "general prisoners." So far as practicable general prisoners are kept apart from other prisoners and are the only class confined in the United States Military Prison and branches thereof. Under the law the United States Military Prison is for the confinement and reformation of military offenders against the rules, regulations, and laws for the government of the army of the United States and includes only officers and enlisted men of the army, and of the marine corps when detached for service with the army, who have been sentenced by court-martial to dismissal or dishonorable discharge and confinement. In February, 1912, was inaugurated the modern prison system of separating as far as practicable prisoners convicted of purely military offenses from those convicted of statutory or common-law crimes or misdemeanors. The general prisoners who are under sentence for purely military offenses and whose records and conduct are such as to entitle them to the privilege are now afforded an opportunity to receive a special course in military training. Under orders of the War Department, Sept. 17, 1913, four disciplinary companies were organized at the United States Military Prison, Fort Leavenworth, Kans., and one at Fort Jay, N. Y. Similar companies are to be organized at the Pacific Branch, Alcatraz Island. Bands composed of prisoners are also authorized. Prisoners granted the privilege of membership in the disciplinary companies work during half the day only, the other half being devoted to military drill and training. It is hoped by this system to reform and restore to the service a certain percentage of men now under sentence of dishonorable discharge and of forfeiture of certain rights of citizenship. Under the new plan, since September, 1913, the Judge-Advocate-General of the army has general charge, direction, and control, under the Secretary of War, of these prisons and their administration. The officers of each prison consist of a commandant, an adjutant, a quartermaster, a surgeon, a chaplain, an

executive officer, an exchange officer, an ordnance and signal officer, and such other officers as the War Department may assign. The enlisted men of the army detached for duty as prison guards are organized into companies, to which officers are assigned for the usual company duties. The number of prisoners confined at Fort Leavenworth varies between 900 and 1000; the number at Alcatraz Island, between 300 and 400; at Fort Jay, N. Y., about 100. About 1000 general prisoners are confined at military posts. In addition to the military instruction for the privileged class belonging to the disciplinary companies, the prison system provides schools, libraries, religious instruction, medical attention, and an opportunity to learn a trade.

MILITARY PUNISHMENTS. See MILITARY LAW.

MILITARY RESERVATION, UNITED STATES. A term applied to every military post, station, or other locality selected and set apart for present or future military occupation. Department commanders supervise all such reservations within their territory and are responsible that trespass and damage are prevented. They are also required to see that every consideration is given to their care, preservation, and adornment, and that every available means is employed to make them attractive homes for the army. The grounds are improved so far as possible. Where the reservations are of considerable extent or sufficiently practicable, they are stocked with game, and stringent rules made for the protection of native singing birds. Lands reserved for military use and military posts temporarily evacuated by troops are under charge of the quartermaster's department. Permanent works of defense and lands appurtenant thereto are under the direction and charge of the engineer department.

MILITARY SANITATION. See HYGIENE, *Military Hygiene.*

MILITARY SCHOOLS. See MILITARY EDUCATION; MILITARY ACADEMY, UNITED STATES.

MILITARY SCIENCE. Military science or "the art of war has for its object: first, to determine the time, place, and character of battles and conflicts so that the greatest benefits may result from victory and the least injury from defeat; second, to make one's self stronger than the enemy at the time and place of actual combat. The first of these objects is accomplished by strategy, including logistics; the second by logistics, discipline, grand and minor tactics, and military engineering. None of these branches can be practiced, or even intelligently studied separately; nor can one be rated as of higher value than the others, since ultimate success must depend upon them all. The highest strategy accomplishes nothing unless the logistic and tactical requirements for success in battle are satisfied. The best tactical arrangements and actions may result in victories entirely barren, even sometimes worse than defeat, owing to faulty strategical dispositions; while a failure in logistics will, of necessity, destroy all strategical and tactical combinations.

"To show more clearly the relations of these subdivisions to the objects of the art of war, it is only necessary to call attention to the fact that whether or not the 'greatest benefit will result from victory and the least injury from defeat' will depend upon the positions of the opposing armies with reference to each other's communications, lines of retreat, and objectives, before and after conflicts, the moral and political effects produced by the results of battles, and the times of their occurrence. These considerations evidently involve questions of strategy, including statesmanship, both in planning campaigns and forecasting their results; and logistics, in preparing for the execution of the plans. The second object will be accomplished to a greater or less degree: first, by rapidity of concentration, giving a greater number of men at the place of actual conflict. Second, by better arms, ammunition, and supplies, better defensive arrangements, better training and discipline, or better handling of the masses or small groups, making the same, or a less, number of men stronger than the hostile force. Third, by localizing the conflict upon a point where this superiority exists. The first is a question of logistics; the second of logistics, engineering, discipline, and grand or minor tactics; and the third of grand or minor tactics, depending upon the force engaged.

"Tactics may be defined generally as the art of so handling bodies of troops, large or small, as to utilize to the fullest extent the fighting, manœuvring, and resisting capacity of every individual, weapon, and resource of all arms of the service. When applied to the combined action of large masses, made up of different arms, it is called grand tactics. When restricted to the actions of small bodies, or single arms, it is called minor tactics. This division is general and not well defined, since the two run imperceptibly into each other.

"Logistics embraces all the details of moving and supplying armies. It is essentially the province of the staff, and its different branches are apportioned to the different staff departments.

"Strategy has for its object so to inaugurate and conduct wars, campaigns, and battles as, first, to take advantage of all available means for securing success; and, second, to cause the greatest benefits to result from victory and the least injury from defeat. . . . Under the first heading it involves questions of statesmanship and diplomacy. . . . Under the second it is more frequently concerned in the moral effect to be produced by a battle, resulting, in case of victory, from the absolute losses inflicted upon the enemy or the disadvantageous positions in which he may be placed with respect to his bases of supply and lines of communications; and, in case of defeat, from the corresponding losses of our own army." (*Elements of the Art of War*, by James Mercur, Colonel, U. S. A., professor of civil and military engineering at the United States Military Academy, West Point, N. Y.)

Military engineering includes the technical work connected with the construction of permanent and field fortifications, including siege works, reconnaissance, constructing and dismantling bridges, military roads and trails, the construction, operation, and maintenance of railroads in the theatre of operations under military auspices and for military purposes, the transportation of engineering equipment such as reconnaissance instruments, the light and heavy bridge trains, intrenching tools, etc. Consult *Engineer Field Manual, United States Army.*

Logistics falls under the general head administration, as distinguished from organization and operations. The details of moving and supplying armies, or logistics, come under two very general classes of activities: the service of the interior and the service of the theatre of opera-

tions. The service of the interior is carried on by department (territorial) commanders and bureau chiefs having for this purpose general depots of supply, general hospitals, arsenals, etc. The service of the theatre of operations is carried on by the commander of the field forces and is divided into two zones: (*a*) the zone of the line of communications, (*b*) the zone of the advance. The function of the service of the interior is to supply the commander of the field forces with the means necessary for the accomplishment of his mission, i.e., to concentrate such means at the principal base of the field forces. From this principal base up to and including the advance bases in rear of the fighting divisions extends the line of communications, the commander of which is responsible to the field commander for its efficient operation and defense. From the advance bases to the fighting units is the zone of the advance, within which operate the division combat, field, ammunition, supply, sanitary, and engineer trains, designed to supply their fighting units so as to keep them always ready for action and without hampering their freedom of movement. Consult *Field Service Regulations of the United States Army* (Washington, 1914). See LOGISTICS; STRATEGY; TACTICS, MILITARY.

MILITARY SERVICE INSTITUTION OF THE UNITED STATES. An organization controlled by officers of the United States army, associated with the National Guard and others for professional improvement, the interchange of views upon military matters, and such topics in general as may be calculated to promote the military interests of the United States. In 1877 General Stanley, General Fry, General Rodenbough, and Colonel Lieber issued a circular requesting the presence of the officers in the army at a meeting to consider the practicability of forming an association similar to the Royal United Service Institution of Great Britain. About 40 officers responded, and the Institution was organized, with General Hancock as president. The headquarters of the Institution are at Governors Island, N. Y. The *Journal of the Military Service Institution*, a bimonthly, published its first number in January, 1880, and is devoted to military history and the discussion of current military questions, domestic and foreign. It is universally regarded as a publication of great international importance in its own domain. Under the management of the publication committee, essays upon military subjects, for which prizes of gold and silver medals and money are annually awarded, have been a feature. Under an agreement between the Public Library of the City of New York and the Military Service Institution, the entire collection of books and pamphlets belonging to the Institution (amounting to nearly 10,000 volumes, among which are many rare books and manuscripts), with the exception of those needed for reference, has now been placed in a section of the library at Fifth Avenue and Forty-second Street, to be known as the Military Section, duly catalogued and made available for the circulation to members of the Institution and for reference to the general public. The Institution also possesses a valuable collection of military relics and trophies, together with specimens or models after the latest war material, open to visitors.

MILITARY SIGNALING AND TELEGRAPHING. See SIGNALING AND TELEGRAPHING, MILITARY.

MILITARY SURGEON. See SURGEON, MILITARY AND NAVAL.

MILITARY SURGERY. See SURGERY, MILITARY.

MILITARY TACTICS. See TACTICS, MILITARY.

MILITARY TENURE. A form of landholding in England under the feudal system of land tenure, originally based on the obligation of the freehold tenant to render actual military duty to the crown as the service or rent due from the land so held by him. It was also known as tenure in chivalry or by knight's service. See FEUDALISM; TENURE.

MILITARY TERRITORIES OF FRENCH SUDAN. Formerly three territories comprising the eastern part of the African region previously known as French Sudan (q.v.), and extending from the eastern boundary of French Senegal and French Guinea to Lake Chad, and from the northern borders of Nigeria, Dahomey, Togo, the Gold Coast, and the Ivory Coast northward into the Sahara Desert. The region included in these territories comprised in 1915 the French colony of Upper Senegal and Niger and the Military Territory of the Niger. See FRENCH SUDAN; FRENCH WEST AFRICA; NIGER, MILITARY TERRITORY OF THE; UPPER SENEGAL AND NIGER.

MILITARY TRENCH. See TRENCH, MILITARY.

MILITARY UNIFORMS. See UNIFORMS, MILITARY AND NAVAL.

MILITARY VOLUNTEER. See VOLUNTEER, MILITARY.

MILITCHEVITCH, mē'lē-chĕv'ĭch, DJAKOV MILAN (1831–1908). A Servian ethnologist and writer on educational topics. He was born near Belgrade. Having studied theology and done some teaching, he obtained, in 1852, a state office and was made secretary to the Servian Minister of Education in 1861. In 1886 he was appointed librarian of the Belgrade National Library. Among his writings are an exhaustive topographical work, *The Principality of Servia* (1876); *Servian Peasant Life* (1867, 1894); *The Kingdom of Servia* (1884); *Letters on the History of the Servians and Bulgarians* (1858–59); *Education in America* (1863); *Letters of a Tourist* (1865); *Schools in Servia* (1868); *Lives of Famous Servians* (1888); the pedagogical periodical *Skola* (*The School*, 1868–76), and short sketches like *Furmus and Fatima* (1879) and *Winter Evenings* (1879). Militchevitch was one of the most learned and talented Servian authors of his time.

MILITELLO, mē'lē-tĕl'lō, IN VAL DI CATANIA. A town in the Province of Catania, Sicily, situated 25 miles southwest of Catania, with which it is connected by rail. It trades in wine, tropical fruit, and silk. Pop. (commune), 1901, 11,539; 1911, 11,232.

MILITIA, mĭ-lĭsh'ȧ (Lat. *militia*, military service, soldier, from *miles*, OLat. *meiles*, soldier). The entire body of male citizens liable to military duty. In England, since 1908, the organized forces are called the *regular army* and the *territorial army*. The regular army has two reserves—the *army reserve* and the *special reserve*. The latter was created out of the militia in 1907. The *territorial army*, which serves only at home in peace time and is intended primarily for home defense, amounted to 315,000 in 1914. This latter force corresponds to the *organized militia* in the

United States. In addition the colonies maintain militia forces, called citizen forces or territorial armies. Specifically the title applies to the purely defensive branch of the national military system of the countries referred to, the *mobile* and *territorial militia* of Italy and the *opolchénié* of Russia closely resembling it. The *Landwehr* and *Landsturm* of Germany and Austria and the *territorial army* of France may also be regarded as the militia equivalent, the service, however, being compulsory instead of voluntary as in England and the United States. In the United States the system differs somewhat from the English in that it is not a Federal or national force, unless called into the service of the Federal government or unless accepted as volunteers by the President during the existence of war or when war is imminent under the provisions of the Act of Congress approved April 25, 1914. When the militia, as such, is called into the service of the United States it must serve during the period specified by the President in the call for militia, but individuals cannot be held beyond the period of the existing State commission or enlistment, usually two or three years. As militia it cannot serve without the territorial limits of the United States. If the militia, however, changes its status to that of volunteers and is accepted as such under the Volunteer Act of April 25, 1914, such troops then serve, unless sooner discharged, for a period of four years, and may be employed beyond the territorial limits of the United States. The act quoted is regarded as one of great moment in that it affords a means of changing the State militia into a true Federal force subject to all the rules and regulations of the regular army except that no reserve service is required. From 1775 to 1783 the bulk of the Federal armies consisted of State troops, a condition which continued to exist long after the Revolution itself. The United States militia consists of every able-bodied male citizen of the respective States, Territories, and the District of Columbia, and every able-bodied citizen of foreign birth who has declared his intention to become a citizen, who is more than 18 and less than 45 years of age. It is divided into two classes—the organized militia, known as the national guards of the State, Territory, or District of Columbia, or by such other designation as may be given them by the laws of the respective States or Territories, and the remainder known as the reserve militia. It is impracticable of course for the President to call out this reserve militia, as it does not possess a military organization. The organization, armament, and discipline are the same as those prescribed for the regular and volunteer armies of the United States, but the effectiveness of the organized militia as a military force is seriously handicapped by the constitutional provisions which reserve to the State the appointment of all officers in peace and war, the training and government of the forces when not in the service of the United States, and the limited instruction provided by the State authorities in peace. The officers are usually elected by the men and appointed by the governor. The President may call out, for a period specified by him, such numbers of the militia of the States, Territories, or District of Columbia as he may deem necessary "to suppress insurrection, repel invasion, or to execute the laws of the Union," but for no other purpose. During their period of service they become subject to the same rules and articles of war as the regular forces, except that they cannot be called upon to serve outside the United States. Experience in using State militia as a Federal force has always proved unsatisfactory. In 1915 legislation for the creation of a national militia was under consideration. Each State and Territory and the District of Columbia has an adjutant general, who is charged with the duties as prescribed by the State and the rendering of regular reports to the Secretary of War regarding the strength, condition, etc., of the organized militia of the State to which he belongs. See *Army* under UNITED STATES.

The table on page 668 is an abstract of the militia force of the United States (organized), according to the report of the Chief of Division of Militia Affairs, War Department.

The militia of Great Britain was a constitutional force raised under authority of Parliament for national defense only. It could not be used on foreign service without its consent and the authority of Parliament. Before the Norman Conquest rents for land were paid in body service, the able-bodied men of each family bearing arms in numbers proportionate to the land held by the family. This system is attributed to the Saxon King Alfred. The country was organized into dukedoms, hundreds, tithings (ten tithings making the hundred), and families, the number of families in a tithing varying with the necessities of the times. After the decisive battle of Hastings (1066) the *fyrd*, as the militia was then called, ceased to exist officially, although continuing to give the Normans considerable trouble. The national exigencies during the Seven Years' War rendered imperative the reorganization of 1757, since which period more attention has been devoted to it. In 1871 the War Office assumed control and the county authorities ceased to have any active interest in it other than the right to nominate officers. In 1906 it was a part of the military territorial system, two or more local militia battalions being attached to each territorial district and forming the third, fourth, or fifth battalion (as the case might be) of the regular regiments to which they were attached. In 1908 the militia was abolished and converted into the special reserve and territorial force. See *Army* under UNITED KINGDOM.

In Russia what is now the opolchénié was originally a simple militia, which was reorganized in 1888 and again in 1891, when the period of service was changed from 40 to 43 years for the soldiers and from 50 to 55 for the officers. Service in the Russian army, 1914, is as follows: from the twentieth to the forty-third year, divided into two classes—service in the active army and its reserve for 18 years, service in the opolchénié or territorial army for 5 years. The opolchénié is divided into two "bans," or levies, (1) trained men who have passed through the active army and the annual surplus of young men, (2) the levy en masse, containing all those exempted from actual service, whether as students, only sons, or those not up to physical standards, and also the older classes of the surplus men who have all had a certain amount of training. This second "ban" corresponds to the United States reserve or unorganized militia.

Service in the Italian army, 1914, is for 19 years. Commencing at the age of 20, there are three classes, as follows: first, those in the permanent army; second, those in the permanent

STRENGTH OF THE ORGANIZED MILITIA OF THE UNITED STATES AND HAWAII, 1914

STATE, TERRITORY, OR DISTRICT	General officers of the line	Officers, Adjutant General's Department	Officers, Inspector General's Department	Officers, Judge Advocate General's Department	Quartermaster Corps or Department		Subsistence Department		Medical Department		Officers, Pay Department	Corps of Engineers		Ordnance Department		Signal Corps		Cavalry		Field Artillery		Coast Artillery Corps		Infantry		Total		Aggregate
					Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men		Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	
Alabama	1	2			4				3	39				1						11	316			141	2,254	163	2,609	2,772
Arizona		(*)			1				4	12														40	633	45	645	690
Arkansas		2	1	1	2				11	2				1										91	1,400	109	1,402	1,511
California	1	2	1	1	2				26	110				1		3	84	16	237	19	263	41	716	139	2,194	252	3,604	3,856
Colorado		2			1		1		13	74		3	26	1		3	47	9	244	6	228			83	1,314	122	1,933	2,055
Connecticut		2	1		2	17			18	98				1	1	3	71	6	125	2	75	45	697	97	1,427	177	2,511	2,688
Delaware		1	1	1	1	2			3	10				1	1									33	452	41	465	506
District of Columbia	1	2	1	1	2	2	2	1	13	75	2			1	1	3	57			4	91			92	1,494	124	1,721	1,845
Florida		2		1	4	3			5	18				1	1									60	1,053	73	1,075	1,148
Georgia	1	3	1	1	5	1			15	26				2				18	229	12	214	14	143	153	1,877	225	2,490	2,715
Hawaii		1	1	1	3				5	15				1										44	843	56	858	914
Idaho		1	1	1	3				6	24				1										45	815	58	839	897
Illinois	2	6	3	3	14	1			45	177		4	60	3	1	3	51	36	522	14	260			375	4,375	508	5,447	5,955
Indiana	1	2		1	4				14	106				1		3	61			13	225			130	1,717	169	2,109	2,278
Iowa	1	2		1	5				21	84				1										186	2,930	217	3,014	3,231
Kansas		2	1	1	5				7	25				1						5	98			110	1,597	132	1,720	1,852
Kentucky	1	2	1	1	2				16	87				1										140	2,123	164	2,210	2,374
Louisiana		1	1		1				10	30				1				3	46	13	245			35	679	65	1,009	1,074
Maine		1	1	1		1	1	1	9	38				2								44	677	49	687	108	1,404	1,512
Maryland	1	2	1	1	3	2			16	78				1	1			3	57					129	1,848	157	1,986	2,143
Massachusetts	2	4	3	3	6	5	3	2	41	160	4			3		3	86	16	230	17	332	48	718	271	3,836	424	5,369	5,793
Michigan	1	2	1	1	2		1		11	106	1	3	97	1		3	56	6	97	12	127			144	1,995	189	2,478	2,667
Minnesota	(†)	3	1	1	4				14	49				2						36	626			159	2,568	220	3,243	3,463
Mississippi		2	1	1	1		1		12	16	1			1										74	974	94	990	1,084
Missouri	1	1	1	1	5	4			17	110				2	1	4	89	2	59	7	204			203	3,373	244	3,840	4,084
Montana		1			1				2	12														36	624	40	636	676
Nebraska		2	1	1	2	1			20	88				1	1	4	86							101	1,208	132	1,384	1,516
Nevada‡																												
New Hampshire		1		1	2	3			7	32				1		1	37	3	61	5	133	16	214	53	800	90	1,280	1,370
New Jersey	1	4	1	2	8				27	130				1	3	1	59	10	176	10	199			236	3,447	304	4,014	4,318
New Mexico		1		1	1				6	17										4	133			44	760	57	910	967
New York	5	7	5	3	4	48	3	7	117	581		46	708	5	18	6	155	59	921	60	1,063	106	1,839	518	10,251	974	15,591	16,565
North Carolina	1	2	1	1	5				25	59				2				6	89			20	354	145	1,865	209	2,367	2,576
North Dakota		1		1	1				4	23														53	656	60	679	739
Ohio	2	5	2	1	9				47	242		13	177	2		11	113	17	207	16	254			365	4,644	490	5,637	6,127
Oklahoma		1	1	1	2				11	46		3	61	1		5	163	5	118					47	942	77	1,330	1,407
Oregon		1	1	1	2				6	32				1				3	66	5	76	34	521	46	706	100	1,401	1,501
Pennsylvania	5	5	5	3	9	6	6	6	42	175		6	117	5	5	3	57	31	419	9	156			616	9,219	745	10,190	10,935
Rhode Island		1	1	1	1	6			9	36					4			11	157	5	112	67	988			96	1,303	1,399
South Carolina	1	2	1	1	5				5	24				1										140	1,770	156	1,794	1,950
South Dakota		1	1	1	3				6	22				1										55	851	68	873	941
Tennessee		1	1	1	2	1			14	138				1				3	48					94	1,611	117	1,798	1,950
Texas	1	2	1	1	6				23	57				1				14	207	3	94			140	2,373	192	2,731	2,923
Utah		1	1			1			3	17						3	52			5	88			16	261	29	419	448
Vermont		1	1	1	2				5	19				1				15	153					49	645	75	817	892
Virginia	1	2		1	2	1	1		14	66	1			1		3	69			17	215			163	2,255	206	2,606	2,812
Washington		1			2	1			7	24				1		1	77	3	76			15	283	55	851	88	1,312	1,400
West Virginia		1			2				8	36	1			1										91	1,481	104	1,517	1,621
Wisconsin		2			3	2			15	84					1			3	68	4	87			166	2,689	193	2,931	3,124
Wyoming		2		1	1				4	18														46	742	54	760	814
Total, inspections 1914	31	98	47	48	157	108	19	17	783	3,556	10	78	1,246	59	39	72	1,470	298	4,642	314	5,914	450	7,150	6,328	95,109	8,792	119,251	128,043

* Detailed from First Infantry; included in regimental report.

† Vacancy in office of brigade commander

‡ No organized militia (mustered out May 20, 1906).

army but with "unlimited leave"; third, those exempted from active service, who are assigned to the territorial militia. The time is spent as follows: 2 years with the colors, 6 years in the reserve, 4 years in the mobile militia, 7 years in the territorial militia, total 19 years, thus completing service at the age of 39.

Service in the French army, 1914, is from the age of 20 to 48. In the first line or active army, 3 years; in the reserve for that army, 11 years; in the territorial army, 7 years; in the territorial reserve, 7 years; total service 28 years, ending in the forty-eighth year.

In Switzerland the entire army, comprising as it does every able-bodied citizen, is a militia. Switzerland is unique in that it has no permanent or standing army, depending solely on its national militia. Service extends from the seventeenth to the forty-eighth year, actual service commencing at 20. Periods (1914) are as follows: 12 years in the first line, called the Auszug or Elite; 8 in the Landwehr; 8 in the Landsturm. A soldier has from 65 to 90 days' training the first year, and subsequent annual trainings of 11 days each for seven years, when all below the rank of sergeant are excused from further attendance. The Landwehr are called out only once for 11 days. It is thus seen that this is a true militia—first trained and then returned to civil pursuits, subject to call when needed—and that there is no standing or permanent army as in the other countries just referred to. This militia service, however, is compulsory and universal. See CONSCRIPTION; LANDSTURM; LANDWEHR; NATIONAL GUARD; VOLUNTEER, MILITARY; and section *Army* under the different countries.

MILIUM, mĭl'ĭ-ŭm. A skin disease known also as grutum. It is characterized by the formation of small, round, noninflammatory elevations situated immediately beneath the epidermis and consisting of sebaceous matter. These bodies are distributed mainly on the eyelids, forehead, and face, occur especially in elderly people, and may in time undergo calcification. Colloid milium is a rare form of the disease in which the bridge of the nose, forehead, and cheeks present minute shining lesions of a pale lemon color.

MILK (AS. *meole, meoluc,* Goth. *miluks,* OHG. *miluk,* Ger. *Milch;* connected with AS. *melcan,* OHG. *melchan,* Ger. *melken,* Lat. *mulgere,* Gk. ἀμέλγειν, *amelgein,* OChurch Slav. *mlēsti,* Lith. *milsti,* to milk, Skt. *marj,* Av. *marəz,* to rub off). The liquid secreted by the mammary glands of all mammals and used primarily to nourish their young. From the earliest time it has been esteemed an important and necessary article of food and many hidden virtues were ascribed to it by the ancients. Its exact composition continued long unknown, and until the beginning of the seventeenth century fat, casein, and whey were the only constituents recognized. In the early part of the eighteenth century Leeuwenhoeck discovered the microscopical characteristics of milk, and about the same time Boerhaave made a qualitative examination. The first quantitative analysis of milk recorded was made in 1737 by Geoffrey, who determined with considerable accuracy the casein, milk sugar, and mineral matter.

The milk from different animals varies considerably in composition, as shown in the following table:

COMPOSITION OF MILK

KIND	Water	Total solids	IN TOTAL SOLIDS				
			Fat	Casein	Albumin	Milk sugar	Ash
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Woman	87.4	12.6	3.8	1.0	1.3	6.2	0.3
Cow	87.2	12.8	3.7	3.0	0.5	4.9	0.7
Buffalo	81.4	18.6	7.5	5.8	0.3	4.1	0.9
Goat	85.7	14.3	4.8	3.2	1.1	4.4	0.8
Ewe	80.8	19.2	6.9	5.0	1.5	4.9	0.9
Llama	86.5	13.5	3.2	3.0	0.9	5.6	0.8
Mare	91.5	8.5	1.2	1.2	0.1	5.7	0.3
Ass	89.6	10.4	1.6	0.7	1.6	6.0	0.5
Camel	86.6	13.4	3.1	4.6	4.0	5.6	0.7
Sow	84.0	16.0	4.0	7.2	7.2	3.1	1.1
Elephant	67.9	32.1	19.6	3.1	3.1	8.8	0.6
Porpoise	41.1	58.9	45.8	11.2	11.2	1.3	0.6
Dog	75.4	24.6	9.6	6.1	5.1	3.1	0.7
Cat	82.1	17.9	3.3	3.1	6.0	4.9	0.6

The above are general averages of a greater or less number of analyses, depending upon the kind of milk animal, each kind of which gives milk that varies considerably with the individual as well as with the species. There is, furthermore, some difficulty in arriving at a general average for any kind of mammal, since normal milk is obtained with difficulty from animals unaccustomed to being milked.

Properties of Cows' Milk. Since, in general properties and composition, cows' milk is typical of all milks, is of chief commercial interest, and has been studied much more in detail, it will be the main subject of this article. The milk secreted immediately after parturition is termed *colostrum* (q.v.), or *beastings,* and differs considerably from normal milk in both physical and chemical characters. Milk from which the fat has been removed by skimming or by the separator is called skim milk (q.v.), and the residue left after churning cream is known as buttermilk (q.v.). Whey (q.v.) is the liquid remaining after the curd of the milk has been separated.

Cows' milk is an opaque, whitish liquid, sometimes faintly yellow or bluish, with a slight alkaline reaction and a sweetish taste when fresh. It is heavier than water, its specific gravity ranging usually from 1.029 to 1.035, the average for mixed milk being about 1.032. By removing the fat (skimming the cream) the specific gravity is raised and by adding water it is lowered. This is the basis of a simple, but (when taken alone) unreliable, test of the qual-

ity of milk and of the practice of skimming. Chemically, milk consists of an aqueous solution of milk sugar, casein, albumin, and ash, with the fat in suspension, forming an emulsion. The water and the constituents dissolved in it constitute the milk serum, and the constituents (i.e., the dry matter) minus the water are designated total solids. The proportion of total solids is a general indication of the richness of the milk. Among the solids the chief importance attaches to the fat. First, it is the measure of the value of milk for butter making, and to a very great extent for cheese making also; second, it is the constituent which more than any other gives milk its appearance of richness; third, it fluctuates more widely than any other constituent. Milk fat is a familiar substance in the form of butter, which contains about 85 per cent of fat, some water, salt, and casein. The fat in milk is in the form of minute globules held in suspension, and on standing it rises to the surface as cream (q.v.), which contains some of the other constituents in smaller proportion. The globules may be readily seen by means of a microscope. For a long time fat globules were believed to be surrounded by a membrane or proteid coating, which was destroyed by churning the cream and thus allowed the fat to unite into a solid mass. This view is still held by some, but the prevailing belief at present is that the globules are free and owe their spherical form to the surface tension. The globules vary greatly in size, being from $\frac{1}{1500}$ to $\frac{1}{25000}$ of an inch in diameter. A pint of average milk has been estimated to contain not far from a million globules. The size of the globules varies with the period of lactation, diminishing towards the close, and to some extent with the breed and the individual. The globules in the Jersey and Guernsey milk are relatively large; in Holstein milk very small. The large globules rise more rapidly, and milk containing them creams more readily and completely.

Milk fat is a pale yellow substance consisting of a mixture of the glycerides of eight or more fatty acids. Of these olein constitutes about 35 per cent, palmitin 25.7, myristin 20, laurin 7.5, butyrin 3.85, caprin 3.6 per cent, and the remainder is principally caprylin and stearin. By the action of caustic alkali these glycerides are broken up into their respective fatty acids and glycerin, and a certain relatively small proportion of these, including the butyric, caproic, and caprylic acids, are volatile. The characteristic flavor and aroma of milk and butter are due largely to butyrin, and this decomposes readily, forming butyric acid, which is evident in rancid or "frowy" butter. The chief nitrogenous or albuminoid constituent of milk is casein, which is of prime importance in cheese making. It is coagulated by rennet and by acids, and this is what gives sour milk its thick curdled appearance. The acid developed in souring precipitates the casein, which gradually separates from the soluble constituents, inclosing much of the fat. Casein is held in solution in milk by the presence of lime salts, and lime water causes it when curdled to separate in a much more finely divided condition. The albumin of milk is not curdled by acids or rennet, but is acted upon by heat. Fibrin, similar to that of blood, globulin, nuclein, and several other nitrogenous bodies, have been found in milk in small quantities, but are of little importance. The sugar in milk, chemically known as lactose, is not so sweet as cane sugar. It is in solution. The ash of milk consists of a mixture of a number of salts, but is composed principally of the phosphates of lime and potash, the chlorides of potash and soda, and small amounts of phosphate of iron and magnesia. Some of the phosphate of lime appears to be associated with the casein, which also contains some sulphur. Most of the salts are in solution. Besides the constituents named, milk contains normally a coloring matter, a trace of citric acid, urea, and several other bodies. The fat and the albumin of milk are the most variable constituents, the ash and the sugar the least so. The casein bears a quite constant ratio to the fat, rising and falling with it.

The natural yellow color of milk, as Eckles has found, is due to the pigments carotin and xanthophyll, constituents of green plants, which are taken up from the feed and secreted in the milk fat.

Variations in Milk. The richness of milk is to a certain extent an individual characteristic; i.e., some individuals normally give rich milk, while others, for no apparent reason, give milk containing large percentages of water. The richness of milk has been increased by domestication, care, and breeding, and certain breeds of cows, sheep, goats, etc., have been produced which give a characteristically rich milk. The quality also varies with the stage of lactation. The milk given early in the lactation period is usually poorer than that secreted later, and grows richer towards the close of the period until the animal "goes dry." Young animals usually give poorer milk and less of it than after the third or fourth parturition, and the milk from the first part of any milking is poorer than the last part, or "strippings." The kind of food has little effect on the composition of milk, provided it is wholesome and the amount sufficient. Food influences the proportion of the different fatty acids composing the fat, and so has an effect on the hardness and other qualities of butter. But the rather prevalent notion that the milk fat can be permanently increased by feeding has been shown by much careful investigation to be a fallacy. Little is known of the physiological processes by which the constituents of the food are transformed into milk constituents. In some cases there appears to be a direct transmission of the constituents from the food to the milk, as is noticeable when cows eat garlic, onions, etc. The experiments of Jordan at the New York State Experiment Station have shown that milk fat is not derived solely from the fat of the food, for cows fed upon food from which the fats were practically completely extracted continued to secrete milk of normal composition for long periods, and, judging from the maintenance of their weight, did not draw upon their body fat to supply this ingredient. Under the conditions of the experiments the carbohydrates seemed to be utilized to some extent in the elaboration of milk fat. The more the process of milk secretion is understood the more apparent it becomes that richness and the volume of the yield are individual characters, and if cows have a tendency to give poor milk no amount of feeding will overcome it. The remedy lies in getting better cows. For general statements regarding the composition of the milk of different breeds of cows, see CATTLE.

As an illustration of the variation of the milk of ordinary cows of mixed breeding the data

obtained by Van Slyke in New York from the analysis of the mixed milk of 15,000 cows each month from May to October may be cited. The total solids ranged from 11.17 to 13.91 and averaged 12.67 per cent, and the fat from 3.04 to 4.06 and averaged 3.75 per cent. The content of total solids and of fat was lowest during the summer months and increased in the fall. In the analysis of over 3000 samples of milk at the Massachusetts Experiment Station the total solids varied from 10.02 to 19.55 and averaged 13.57 per cent, and the fat from 1.5 to 10.70 and averaged 4.32 per cent. The analysis of 800 samples made at the experiment stations in different parts of the country varied in total solids from 9.3 to 19.7 per cent, averaging 12.8 per cent, and in fat from 1.7 to 6.5, averaging 3.7 per cent.

Milk Fermentations. Milk is subject to a great variety of fermentations, for it is a favorable medium for the growth of many kinds of bacteria, yeasts, and other fungi which cause numerous changes in its constituents. Thus, while one class of organisms curdles milk by the production of lactic acid, another class gives it an alkaline reaction, at the same time curdling it; others impart to it a deep blue, violet, yellow, green, or red color, by the production of pigments in the milk; others give it a bitter or other unpleasant taste; another class produces alcohol from the milk sugar, and is taken advantage of in the preparation of such beverages as kumiss and kefir (qq.v.), and still others cause putrefaction. The most common and familiar change is the souring of milk, due usually to the action of lactic-acid bacteria. Under ordinary conditions normal milk nearly always undergoes some sort of lactic fermentation on standing. The production of lactic acid soon curdles the milk and obscures all other forms of fermentation, and the acid stops the growth of other bacteria, so that no subsequent effects are usually seen. The popular belief that the electricity in the air during thunderstorms sours milk appears to be unfounded, but its rapid souring at such times is due to the climatic conditions prevailing, which hasten bacterial growth. The same difficulty in keeping milk is experienced during very hot weather. Curdling is not always due to the formation of acid; milk apparently sour may have no acid taste. In such cases the cause is due to alkaline fermentation, induced by another class of organisms. The milk becomes coagulated into a soft slimy mass, which is usually bitter and has an alkaline or neutral reaction. Ordinarily this form of fermentation is not very apparent, as the organisms causing it grow slowly and the lactic-acid organisms get the start of them. The organisms which produce butyric acid in milk attack and decompose the fats, giving a rancid odor. In the ordinary handling of milk the latter are of little importance, but it is supposed that they have an important effect upon the keeping properties of butter. Several organisms have been described which impart a bitter taste to milk, due, in some cases at least, to the production of a bitter principle. Milk which has been boiled is likely to develop a bitter taste, for the reason that the heating kills the lactic-acid germs, while the bacteria causing the bitter taste usually possess endospores which are not destroyed by heat and so have a clear field for action. A slimy fermentation of milk is a somewhat common occurrence, and occasionally produces great trouble in dairies, since it destroys the milk for all ordinary uses. Such milk becomes thick and ropy, will not cream, cannot be churned, and is unfit for drinking. It may be caused by a variety of organisms. There are several forms of the trouble. One known as the "lange wei" (long or stringy whey) is made use of in the manufacture of Edam cheese in Holland, to control the gassy fermentation of the curd.

In addition to the fermentations and other changes in milk due to microörganisms, rennet, an unorganized ferment obtained from the stomach of the calf and from some plants, ferments milk, causing it to curdle. This ferment is employed in cheese making to produce the curd. Babcock and Russell have discovered an unorganized ferment termed "galactase" in milk, which they believe to be a normal and inherent constituent, and which is active in the ripening of cheese, causing the characteristic changes in the green cheese which make it suitable for eating.

The chief sources of bacteria in milk are the cow herself, the milker, the dust of the stable, and the dairy utensils. It has long been believed that pure milk drawn from a healthy cow contains no bacteria and that all bacterial contamination of the milk comes from external sources. However, the large calibre of the milk duct makes it possible for bacteria to enter it and grow to a considerable extent, so that it becomes a matter of extreme difficulty to obtain milk from the cow, even with the greatest precautions, which shall not be contaminated. The hairs of the cow are always covered with dirt and dust, and the air of the stable is charged with dust from the fodder and bedding material, so that it is impossible to prevent some dirt from falling into the milk pail. Thus large numbers of bacteria, especially in poorly ventilated stables, reach the milk. Any dirt upon the hands or clothing of the milker will have abundant chance to get into the milk pails and cans. The milk vessels themselves are an important source of contamination, the corners and creases retaining bacteria which have not been removed or killed by the washing. The warm milk furnishes favorable conditions for the growth of these microörganisms which have gained access and which for a time multiply rapidly.

Several species of bacteria classed as pathogenic organisms are capable of living or even increasing in milk, but since they do not ferment the milk or alter its appearance sufficiently to be detected by a physical examination, their presence is not readily determined. Except in very rare instances the milk becomes contaminated after it has been drawn and in practically all these cases the cause of contamination is some form of uncleanliness, either of the stables, the water, the utensils, or the attendants. It is gratifying to know, however, that through the efforts of the United States Department of Agriculture, the agricultural experiment stations, and the dairymen themselves, the sanitary management of dairies is being constantly improved, and through the vigilance of State-appointed dairy inspectors unsanitary conditions are corrected as soon as discovered.

Milk Adulteration and Control. The milk supply of towns and cities has for many years been regulated by laws and ordinances and subjected to inspection. The object of this was formerly to prevent adulteration, but of recent

years the inspection has often extended to the herds and stables and all that relates to the milk trade. It has come to be realized that such factors as the health of the cows, hygienic condition of the stables, and cleanliness in the handling of the milk are quite as essential to pure wholesome milk as freedom from adulteration. Hence the veterinary inspection, which has been introduced in some cities, should be extended. Milk is most often tampered with by removing a part of the cream or by diluting it with water or skim milk. Coloring matter is sometimes added to make it appear richer, but the addition of chalk, burnt sugar, or similar substances is now rare. Preservatives, such as formaldehyde, borax, and salicylic acid, are frequently added to prevent milk souring. Opinions differ as to the injuriousness of these preservatives, but their use is generally condemned on the ground that they are unnecessary in pure milk and that they are a cloak for insanitary practices in the dairy. The standards for milk adopted by different States vary from 11.5 to 13 per cent for total solids and from 2.5 to 3.5 per cent for fat. Milk found below these standards is held to be adulterated. A standard of 12.5 per cent of total solids and at least 3 per cent of fat seems fair.

Various means of testing milk as to its quality have been suggested from time to time. Of these the lactometer is the simplest and has been extensively used by milk inspectors who have a large number of samples to examine daily to detect watering or skimming. It is a form of hydrometer, and shows the specific gravity of milk upon a graduated scale. But there are so many factors that affect the specific gravity, and this may vary so much in pure milk, that the lactometer reading is only an indication and cannot be relied upon as final. The most reliable and satisfactory of the simple milk tests is the Babcock test, which has come into very widespread use in the milk inspection of towns and cities and in determining the fat content of milk as a basis for paying for the product at creameries. (See CREAMERY; BUTTER MAKING.) This test is made in a special bottle having a narrow graduated neck. A definite quantity of milk is treated in the bottle with sulphuric acid to dissolve the curd and set the fat free. The bottle is then whirled rapidly in a centrifugal apparatus for a few minutes, to aid in separating the fat; hot water is added to bring the fat up into the neck, after which the bottle is whirled a second time and the column of fat read off on the graduated scale. The reading gives the percentage of fat without calculation. A large number of samples may be tested simultaneously, and the method has been shown to be very accurate after a little practice. It shows only the fat content, which is the common measure of richness; but from it and the lactometer reading the total solids and other constituents can be calculated. A bacteriological examination is rarely made in connection with the ordinary milk inspection.

Milk as Food. Milk is peculiarly adapted to be a food for man principally because it contains the four classes of nutrients—protein, fat, carbohydrates, and mineral matter—in more nearly the proper proportions to serve as a complete food than perhaps any other single food material. (See FOOD.) A quart of milk contains about four ounces of nutritive material, or about the same as three-quarters of a pound of beef or as six ounces of bread. Although these quantities of milk, beef, and bread supply like amounts of total nutrients, their nutritive values are not the same. In other words, they would not be equally useful as food, owing to the relative proportion in which the nutrients are present. Protein, fat, and carbohydrates occur in milk in about equal proportions. The chief nutrients in bread are carbohydrates and protein, and in meat protein and fat. Either milk or bread eaten alone would make a better balanced food for man than meat. In general, milk and cream together furnish to the diet of average American families about 20 per cent of the total food, 11 per cent of the total protein and also of the total fat, and about 5 per cent of the total carbohydrates. Dairy products (milk, cheese, butter, and cream) furnish over 22 per cent of the total food, 12 per cent of the protein, 32 per cent of the fat, and 5 per cent of the carbohydrates.

As regards the digestibility of all its ingredients, milk is one of the most digestible of animal foods. It has been found that on an average an adult digests about 97 per cent of the protein, 95 per cent of the fat, and 98 per cent of the carbohydrates of milk. According to American experiments, a child one year old eating milk digests on an average only about 90 per cent of the protein, 96 per cent of the fat, and 86 per cent of the carbohydrates of cows' milk. When milk is taken into the stomach it is speedily curdled by the action of the pepsin and acid of the gastric juice. When eaten alone or in large quantities the casein gathers in large lumps, which in some persons may be difficult to digest. This is particularly the case with infants and with adults whose digestion is weak. The casein of human milk is precipitated in more flocculent form than that of cows' milk, and is thus more easily digested and does not cause irritation. Lime, which tends to prevent the curdling of the casein of cows' milk in lumps, is frequently added as lime water to milk that is to be fed to infants or to adults of delicate digestion. The results of experiments upon the effect of cooking milk are conflicting. The more common experience seems to indicate that cooking or heating the milk renders it more difficult to digest. Some persons, however, cannot take fresh milk with comfort, but can digest boiled milk.

Milk is often said to be a perfect food. It is so for the young of the species of animal producing it, but there are three reasons why it cannot be considered a perfect food for adults. 1. The proportion of water is so large that great quantities (from 4 to 5 quarts) would have to be consumed each day in order to obtain the necessary nutrients. 2. The protein is present in rather large quantities as compared with the fats and carbohydrates. Thus, the milk necessary to furnish the 0.28 pound of protein per day, estimated to be required by a man at moderately active work, would yield only 2700 calories of energy, while milk in sufficient quantity to furnish the 3400 calories estimated as necessary would yield 0.34 pound of protein. 3. It is a well-recognized fact that the digestive functions require that food itself, besides the water taken with it, shall have a certain bulk. Cattle cannot generally be maintained in health upon a condensed ration such as grain; they seem to require a certain distention of the stomach, such as is brought about by the fibre (cellulose or woody matter) of grass or hay. In

like manner it seems desirable that man should have a certain amount of bulky material to produce distention or to promote peristaltic action of the intestines, or for other purposes not well understood. Of course, the nutritive constituents of milk, considered separately, are highly concentrated foods. While, therefore, milk alone cannot be considered as a perfect diet for adults, it is of special value as a food for invalids, because it is, as a rule, easily taken, easily digested, and does not generally irritate the alimentary canal. Furthermore, a milk diet is more readily under the control of the physician both as regards quantity and quality than a mixed diet is. If for any reason a child cannot be nourished on mother's milk, the most useful substitute is modified cows' milk. Various infant foods and milk substitutes have been proposed and are sold under divers trade names.

As a food for adults cows' milk is unusually well adapted for use in connection with other foods, either in its uncooked form in tea and coffee, as a beverage, as bread and milk, etc., or incorporated and cooked with other materials. In many culinary products it can be used instead of water. Analysis of bread, rolls, etc., made with milk would show about one-tenth more protein and one-twentieth more fuel value than bread made with water. Milk is very generally used in many kinds of cake and pastry and in custards. Where desirable from economical reasons, or as a means of increasing the proportional amount of protein in a diet, skim milk can be advantageously substituted for whole milk. At the price ordinarily paid in our large cities milk is a food of reasonable cheapness, and at the prices prevailing in small cities and country towns it is an economical food. Condensed milk is a more nutritious food, pound for pound, than fresh milk, since it has been concentrated by evaporation. It is, however, usually diluted before it is used, and then approximates fresh milk more or less closely in composition and food value. If the condensed milk contains added sugar its carbohydrate content is, of course, higher than that of unsweetened condensed milk, and when diluted, proportionally higher than that of fresh milk. Cream, which contains the greater part of the fat of the milk, as well as some protein and carbohydrates, is chiefly valuable in the diet as a source of energy. Curds obtained in the manufacture of cheese are eaten to a limited extent. They consist quite largely of the casein of milk, and hence supply the body with building material as well as energy. Butter and cheese (q.v.), the principal milk products used as food, are of great importance as articles of diet.

There are at least four distinct fermented beverages prepared from milk—kefir (q.v.), kumiss (q.v.), matzoon (q.v.), and leben. They are properly classed as food beverages and are often recommended for the sick and for convalescents. A number of special foods are made from the dry casein of milk and are used to a considerable extent by physicians to supply protein in a readily digestible form. The albuminoids of milk are used in the manufacture of egg substitutes. Milk sugar prepared from whey is an important article of diet for invalids and is used in medicine and in other ways. See MILK PRODUCTION.

Condensed Milk is the fresh milk of cows from which a considerable part of the water has been removed by evaporation to a semifluid condition, and to which sugar is usually, although not always, added to aid in preserving it. Both the sweetened and the unsweetened products are put up in hermetically sealed tin cans, or in bulk for the use of bakers, confectioners, and ice-cream manufacturers. Originally the unsweetened milk was sold under the name of evaporated cream, but this is forbidden under the pure-food laws.

The process of making condensed milk was invented by an American, Gail Borden, and patented in 1856. In this process the milk was concentrated by heating in a partial vacuum under a low degree of heat, and this principle is still employed in making the great bulk of condensed milk in the United States and Europe, in spite of numerous other processes. The product is made at factories, which require to be equipped with expensive machinery and need a large milk supply, preferably 15,000 pounds a day.

In 1909 the United States Census reported the production of condensed milk at nearly half a billion pounds a year, valued at $33,563,129. In 1914 the total number of condenseries in the United States was estimated at nearly 250. The industry has made rapid progress in Canada, Austria, New Zealand, Switzerland, Germany, Great Britain, Holland, Sweden, Norway, Russia, Japan, and India. The standard for condensed milk is about 28 per cent of total solids.

Milk Powder, Desiccated Milk, or **Dehydrated Milk** is made by evaporating milk, whole or skimmed, to dryness. The difference between the product and condensed milk is mainly in degree of concentration. The industry has developed rapidly in recent years. The bulk of the powder is made from skimmed milk, as that from whole milk becomes rancid rapidly. There are several processes. In one of the most successful the milk is condensed in a vacuum pan to about one-third its volume and then sprayed into a current of hot air in an evaporating chamber, where it rapidly parts with its vapor, the milk solids falling to the bottom as a finely divided powder. The powder contains 5 to 8 per cent of water and from 10 to over 20 per cent of fat, according to the process and the kind of milk used. The skim-milk product has about 37 per cent of proteids and 46 per cent of milk sugar. This product will keep indefinitely if not allowed to become moist. Vast quantities of milk powder are used in making milk chocolate and by bakers and confectioners. The proteids must be in soluble form to make the powder a satisfactory substitute for milk when dissolved in water. This is secured by keeping down the temperature of evaporation to prevent change in these bodies.

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MILK, CONDENSED. See MILK.

MILK, FERMENTED BEVERAGES. See KEFIR; KUMISS; MATZOON.

MILK CURE. The treatment of disease in the adult by the use of milk as a diet. In the milk cure all other food and drink are suspended for a time. Acting upon the information that milk requires about three hours for complete digestion, four ounces of milk are taken by the patient every three hours, beginning on rising in the morning. In a few days one or two tumblerfuls are taken at a time in place of the smaller quantity. Usually a patient takes two quarts a day; in some cases the total amount reaches five quarts. It is generally administered warm. In cases of stomachic or intestinal disorders the milk is allowed to stand for 24 hours and is then skimmed before being administered. Lime water, in the proportion of one-fourth of the bulk, overcomes the patient's repugnance to the diet and renders it more easy of digestion. Or the milk may be flavored with coffee, cocoa, salt, or caramel. After two or three weeks of strict milk diet it is advised that a little stale bread be added three times a day. A week later about two tablespoonfuls of rice or a little arrowroot is added. At the fifth week a chop is given once a day, and a few days later two chops a day are allowed. At the end of the sixth week full meals of various foods are resumed, milk continuing to be a principal part of the diet. Coffee, or aloes, or laxative mineral water is employed to overcome the constipation attendant upon a milk diet in adults.

The milk cure is successful in some cases of dyspepsia, gastric ulcer, chronic intestinal indigestion, enteralgia, chronic diarrhœa, and dysentery. In the treatment of ascites of hepatic origin it has been used since the days of Hippocrates, who refers to it. It has also proved efficacious in kidney and cardiac diseases and in rheumatic and gouty affections.

MILK FEVER, IN WOMEN. A slight, transient rise in temperature, preceded by chilly sensations, attending the establishment of the milk secretion in parturient women. Antisepsis and rational feeding have largely done away with milk fever, some modern authorities even doubting its existence. The older writers describe a condition in which the breasts become swollen, reddened, and tender, with a diminution in the lacteal discharge. It is seen occasionally in well-marked form in debilitated women, in whom a distinct chill, followed by a sharp rise in temperature and sweating, occurs. The condition requires no treatment, as a rule, except purgation.

MILK FEVER, PARTURIENT APOPLEXY, or PARTURIENT PARESIS. An afebrile disease of cows, especially good milkers of improved breeds in good condition, which occurs only at or near the time of calving. Parturition and plethora are preëminently the causes of the disease. Predisposing causes include confinement in the stall, high temperature, electrical disturbances, constipation, and mature age. The latest work indicates that the main cause of the disease is the production of poisonous metabolic products by secreting cells of the follicles of the udder, which act on the brain and central nervous system. The disease rarely follows the first and second calvings. One attack seems to predispose towards another. It appears in two forms—congestive and torpid. In the congestive form the cow suddenly becomes dull, allows the head to droop, staggers in attempting to walk, falls, and lies either on the breastbone, with the head turned around to the side and resting on the muzzle, or stretched out on the side. The pupil of the eye is dilated and the head and horns are hot; the bowels and bladder soon become torpid or completely paralyzed and fail to operate unless recovery takes place. In the torpid form there is no marked fever and no congestion of the head. The animal slowly becomes drowsy and weakened, falls down, and, unless relieved, finally succumbs. Insensibility is a pronounced symptom in the later stages of both forms.

Preventive measures include a spare diet for a week before calving and at least four days after, a free access to salt and water, a dose of Epsom salt (one to two pounds) 12 to 24 hours before calving is due, and the postponing of the drawing of any milk from the udder for 12 to 24 hours after calving.

The treatment of milk fever has been completely revolutionized by the investigations of Schmidt of Denmark, which have resulted in the universal adoption of the method of inflating the udder with oxygen or filtered air. Under this treatment the mortality in milk fever in the cow has dropped from 60 to 75 per cent to less than 5 per cent in those cases which are promptly attended and in which no medicine has been administered by mouth. Drenching of cows suffering from this disease should be rigidly abstained from, since the mortality which follows is exceedingly high, due to portions of the drench passing down the trachea into the lungs. As a prophylactic measure, in case there appears to be any danger of an attack of milk fever, it is now uniformly advised that the udder be inflated at once.

MILKFISH. A large, silvery, herring-like fish of the genus *Chanos* and family Hiodontidæ, which inhabits the warmer parts of the Pacific. One well-known species (*Chanos chanos*), from 2 to 5 feet long, is a food fish of some importance in the south Pacific, Japan, Hawaii, and the Gulf of California. Foreign names for it are chani, awa, auged, sabalo, etc.

MILKING MACHINE. An apparatus designed to do away with hand labor in milking cows. Milking tubes, inserted into the milk ducts within the teats, have been tried, but

found unsatisfactory. Several forms of milking machines have been devised which milk a number of cows at the same time. The most successful of these operate on the principle of a vacuum maintained by a hand or power air pump and so arranged as to give a pulsating action. Pipes connected with the apparatus pass to the stalls and terminate in closed cans fitted with hose and cups, which fit over the cows' teats so as to make an air-tight joint. A pulsating action resembling hand milking or the sucking of the calf is imparted by the vacuum apparatus, alternating in pressure from five to fifteen pounds at quite rapid intervals. In recent years the milking machine has been developed to a quite high state of perfection. Several forms are rapid and effective, but are expensive to install and maintain, and must be thoroughly cleaned or they will soon become foul and contaminate the milk. As yet milking machines have come into only limited use either in America or Europe.

MILK LEG. See PHLEGMASIA ALBA DOLENS.

MILKOWSKI, mĭl-kôf'skē, ZYGMUNT (1824–1915). A Polish novelist, who wrote under the pseudonym Theodor Thomas Jez. He was born at Saracea in Podolia, and was educated at the Odessa Lyceum and at the University of Kiev, where he made a special study of physics and mathematics. He took an active part in the Hungarian uprising of 1848 and then traveled in the East. After identifying himself with the Polish insurrection of 1863 he was obliged to live abroad. He lived in Zurich and was curator of the Polish musems at Rapperswil. Besides romances founded upon Slavic history he wrote stories of contemporary life in which the manners and customs of the south Slavonians and Hungarians are faithfully portrayed. Among the best of these are *Handzia Zahornicka* (1860); *Szandor Kowacz* (1861); *Historya o praprawnuku i prapradziatku* (1864); *Uskoki* (1870). Among his later works are *Ofiary* (1874); *Hercog Slowianski* (1876); *Narzeczona Harambaszy* (1882); *Rycerz chrzescianski* (1890). Less successful than these were his Polish historical novels, such as *Derslarb z Rytwian* (1872); *Za Króla Olbrachta* (1876); *Z ciezkich dni* (1881).

MILK POWDER. See MILK.

MILK PRODUCTION. In a well-conducted dairy farm the following conditions should be enforced: the stable or cow house should be roomy, clean, dry, light, and well ventilated, for only under such conditions can cows be kept in the best of health. The animals themselves should be clean and healthy and should be well fed and contented. There should be an abundance of pure water, to which the cows should have access at least twice a day. The food should be of good quality and the grain and coarse fodder should be free from dirt and decay and not in a musty condition. All utensils which come in contact with milk should be thoroughly washed and sterilized or scalded after using. After the milk has been drawn from the cow it should be taken to a milk room which is free from all stable and other odors, poured through a fine strainer, and run over a cooling aërator (q.v.), to free it of animal and stable odors and cool it quickly. The milk is next transferred to the shipping can and set in cold water, or bottled and stored in a cold place until needed. During transportation from the farm to the town or city the milk should be kept as cool as possible. Refrigerator cars are provided by some railroads for that purpose. Much of the milk that is brought to large cities by rail is from 24 to 36 hours old before it reaches the consumer. This makes it necessary to exercise every precaution in its handling, in order to prevent spoiling, and cooling immediately after milking is an important factor in this connection.

Not only has the demand for clean, pure milk increased greatly, but it has led to the enactment of more rigid restrictions and closer supervision of dairies and to the production at some dairies of so-called sanitary milk. Such milk is produced under the most sanitary and hygienic conditions as regards the food and care of the animals, the stables, the milking, and the care and handling of the milk. The herds in these dairies are inspected often to determine their freedom from disease, and not infrequently the milk is "certified" or guaranteed to contain a certain fixed percentage of fat, as 5 per cent, this being maintained the year round by the addition of cream when necessary. Such sanitary or certified milk is usually sold at an advanced price, as the cost of its production is greater than that of ordinary market milk. The so-called modified milk is a prepared product used principally for infant feeding, and usually made according to a physician's prescription. Some physicians prescribe a milk with a definite composition, usually resembling mother's milk as closely as possible, but varying according to the apparent needs of the individual. Such prescription milk is generally prepared from cows' milk by reducing the amount of fat, and more particularly that of proteids, and increasing the proportion of sugar. Lime water is frequently added to reduce the acidity, and at times preparations made from cereals are added.

For the preservation of milk pasteurization is now extensively practiced. Pasteurization consists in heating the milk in closed vessels at from 60° to 65° C. (140° to 150° F.) for about half an hour and then cooling it as quickly as possible by cold water or ice. By this means most of the organisms contained in it are killed, and the milk will keep much longer than when it has not been so treated. Continuous pasteurizers are used in many creameries and large dairies, and there are a variety of small pasteurizers for family use. Where there is any doubt as to the purity of the milk it is much safer to pasteurize that used for children at home. To a certain extent, however, pasteurization may be used to cover up the effects of careless methods, and many people prefer the sanitary milk. In sterilizing milk the liquid is heated to boiling; but this changes the character of the milk, making it less suitable for drinking and giving it a cooked taste. Pasteurization is sufficient for household purposes.

Statistics. According to the returns of the census of 1910, over 20,000,000 cows are kept in the United States for the production of milk. These produce annually nearly 6,000,000,000 gallons of milk. The total value of the milk consumed as such was estimated at $252,436,757, and of the cream, $37,655,047. The total value of the milk, cream, and butter fat sold and the butter and cheese made in the United States in 1909 was $596,413,463.

See also BUTTER; BUTTERMILK; CHEESE; CREAMERY; DAIRYING; WHEY.

MILK SNAKE, or HOUSE SNAKE. A com-

mon widely spread North American colubrine snake, classified as an Eastern variety (*triangulus*) of the Southern king snake (*Osceola*, or *Ophibolus, doliatus*). It sometimes reaches a length of 4 feet, and its general color above is yellowish gray, with a dorsal series of large blotches, normally 55 in number, and separated by narrow intervals, which are dull chocolate bordered with black. There is also a double row of rounded spots along the sides and a dark band from the eye back to the corner of the mouth. The abdomen is yellowish white, with square black blotches alternating with those above them. This subspecies is abundant in the Middle States and southern Ontario, changing

MILK SNAKE.

southward and west of the Mississippi into other forms of this far-extended and highly variable species. (See KING SNAKE.) Everywhere it is an entirely harmless denizen of fields and gardens, and often comes into barns and outhouses in search of the mice upon which it principally feeds, thereby deserving the protection of farmers. It is swift and agile. Its name milk snake comes from the frequency with which it is seen in dairies or places where milk is kept. It is believed to drink the milk, and there seems to be good evidence that it does so. Another popular belief is that this snake sometimes sucks the milk from the teats of cows, and this belief seems to be founded upon fact, although the occurrence is much less common than some persons believe. See Plate of SNAKES, AMERICAN HARMLESS.

MILK SUGAR. See SUGARS.

MILK TEST. See MILK; DAIRYING.

MILKWEED. See ASCLEPIAS.

MILKWEED BUTTERFLY. A cosmopolitan butterfly (*Anosia plexippus*) which is found in nearly all parts of the world where milkweeds (*Asclepias*) grow. It is also known as monarch butterfly. It is a large reddish species, with its wing veins blackened, and its larva is striking in color, being grayish white and yellowish, transversely banded with black, giving it a zebra-like appearance. The chrysalis is delicate pale green with bright golden spots, and hangs from the leaves or stems of the food plant. The milkweed butterfly is a famous species for several reasons. It is one of the strongest flyers known among the Lepidoptera; specimens have been taken on vessels many hundreds of miles from the land, and there is in the United States an annual migration northward in the spring from the States bordering on the Gulf of Mexico. (See MIGRATION OF ANIMALS.) These flights, aided by the south winds, may reach up into Canada, the butterflies occasionally alighting and laying their eggs upon the milkweeds. In the autumn there is a return migration south, and the butterflies hibernate only in the Southern States, hidden away beneath the bark of trees and in other protected places.

Ordinarily the butterflies frequent open ground, but when they congregate, as at night and in cloudy weather, they are found resting on the stems of herbaceous plants, usually in the open spaces of forests, and in enormous numbers. They will alight upon the lee side of a tree, and particularly on the lower branches, in such vast numbers as almost to hide the foliage and to give their color to the trees. If disturbed, they rise like a flock of birds, but immediately settle again. Sometimes a tree will be so festooned with butterflies that it appears, at a short distance, to be covered with dead leaves.

This butterfly is one of the especially protected species, and is provided with scent scales, "androconia," which are supposed to make the insect distasteful to its natural enemies. It is the commonest and most widespread representative of the large group of butterflies which are thus protected, and is mimicked in coloration by other nonprotected species, e.g., in the United States by *Basilarchia disippus*, or *archippus*. Consult S. H. Scudder, *The Life of the Butterfly* (New York, 1893). See BUTTERFLIES AND MOTHS; MIMICRY; VICEROY.

MILKWORT. A plant common in the north temperate zone. See POLYGALA.

MILKY WAY. See GALAXY.

MILL (AS. *mylen, myln*, from Lat. *molina*, mill, from *mola*, millstone, from *molere*, to grind; connected with Eng. *meal*, mold). A name originally given to machinery for grinding grain for food or to the factory where this was done. The term is now applied in a general way to many other kinds of manufactories besides those where raw material is transformed by a grinding process, as a saw mill, planing mill, or cotton mill. It is also applied in a special sense to a steel rotating cutter for shaping raw material or metal stock. See FLOUR; ROLLING MILL; GRINDING, CRUSHING, AND PULVERIZING MACHINERY.

MILL, HUGH ROBERT (1861–). A Scottish geographer, born at Thurso (Caithness) and educated at Edinburgh University, where he received the degree of D.Sc. in 1886. He served as chemist and physicist to the Scottish Marine Station (1884–87), was a university-extension lecturer (1887–1900), and after 1900 edited *British Rainfall* and *Symons's Meteorological Magazine*. In 1901 he was president of Section E of the British Association and in 1907–08 president of the Royal Meteorological Society. He became chairman of the trustees and director of the British Rainfall Organization. His writings include: *Realm of Nature* (1892; new ed., 1913); *The Clyde Sea Area; the English Lakes* (1895); *Hints on the Choice of Geographical Books* (1897); *New Lands* (1900); *The Siege of the South Pole* (1905); besides many articles. He became best known perhaps as the editor of *The International Geography* (new ed., 1911).

MILL, JAMES (1773–1836). A British economist and philosopher. He was the son of a shoemaker, and was born near Montrose, Scotland, April 6, 1773. He studied at the University of Edinburgh, where he distinguished himself in Greek and in moral and metaphysical philosophy. He was licensed to preach in 1798, but instead of following this career he went to London in 1802 as tutor to Sir John Stuart's children and there settled as a literary man. He became editor of the *Literary Journal* and of the *St. James's Chronicle* and wrote for various periodicals. Not long after he was established in London he made the acquaintance of Jeremy Bentham, who influenced him greatly in his views. In 1806 he commenced his *History of British India*, which he carried on along with

other literary work and published in the winter of 1817–18. This important work, though containing an attack upon the administration of the East India Company, secured for him in 1819 the post of assistant examiner of Indian correspondence. Before his death he was appointed head of the examiner's office, where he had the control of all the departments of Indian administration—political, judicial, and financial—managed by the secret committee of the court of directors. He contributed many important articles to the *Encyclopædia Britannica* (1814). Some of these essays were printed in a separate form and became widely known. In 1821–22 he published his *Elements of Political Economy*, a work prepared primarily with a view to the education of his eldest son, John Stuart Mill. In 1829 his magnum opus, the *Analysis of the Human Mind*, appeared. The work is almost the Bible of associationism and deserves to be classed among the great English philosophical productions. He attempted to simplify associationism by recognizing only one principle at work—that which was later called association by contiguity. (See ASSOCIATION OF IDEAS.) This principle can so fuse various ideas and feelings that a result may be produced entirely different from the original element. This has been called mental chemistry. In his *Fragment on Mackintosh* (1835) Mill made great use of mental chemistry in support of the doctrine that morality is based on utility. (See UTILITARIANISM.) In this way he furnished a psychological basis for Bentham's ethical and legislative reforms. He took great interest in political questions and was a powerful advocate of an extended suffrage. Much of his influence was due to his strong personality and great conversational powers. In later life he entirely broke away from his early religious views and brought up his son John Stuart in utter religious indifference. He took a leading part in the founding of University College, London. He died at Kensington, June 23, 1836. Consult: J. S. Mill, *Autobiography* (London, 1873; new ed., ib., 1908); Alexander Bain, *James Mill: A Biography* (ib., 1882); Sir Leslie Stephen, *The English Utilitarians*, vol. ii (New York, 1900).

MILL, JOHN (1645–1707). A scholar of the Church of England. He was born at Shap, Westmoreland, studied at Queen's College, Oxford, and was elected a fellow in 1670. He entered the ministry and became distinguished as a preacher; he became rector in 1681 of the college living of Bletchington, Oxfordshire, and chaplain to Charles II. In 1685 he was principal of St. Edmund Hall and in 1704 became prebendary of Canterbury. The work for which he is most distinguished is his new edition of the Greek Testament, on which he spent 30 years and which appeared only 14 days before his death. It was undertaken at the advice and expense of Dr. Fell, Bishop of Oxford, but after the Bishop's death (1686) Mill continued it at his own expense and repaid to the executors what he had received. The text which Mill adopted is that of Robert Stephens of 1550, and his work contains 30,000 various readings collected from manuscripts, commentaries, writings of the fathers, etc. Dr. Daniel Whitby attacked the work in his *Examen Variantium Lectionum Johannis Millii* (London, 1709); but Dr. Richard Bentley approved the labors of Mill, and Michaelis, Marsh, and other critical scholars acknowledged the value of the edition.

MILL, JOHN STUART (1806–73). An English philosopher, the son of James Mill. He was born in London, May 20, 1806, and was educated at home by his father, who gave his precocious son an extraordinary amount of learning at a very early age. He is said to have begun Greek at three. He was never allowed to indulge in the plays of childhood. In 1820 he went to France, where he lived for upward of a year, making himself master of the French language and occasionally attending public lectures on science, but also, now that he was away from his father, getting some physical exercise in fencing and like sports. This stay in France gave him an intense appreciation for the pleasures of travel, and to the end of his days he was an ardent lover of mountain scenery. But the world of men had also its interest for him while he was abroad, for then he laid the foundation of his great familiarity with and interest in the politics as well as the literature of the French nation. On his return he read law, history, and philosophy, and in 1823 entered the India House as a clerk in the examiner's office, where his father was assistant examiner. For 33 years he was in the service of this company, gradually rising till at last he was head of his department, as his father had been before him. When the government of India was transferred to the crown in 1858, he declined a seat on the New Indian Council and retired from office in October of the same year, on a compensating allowance. At the general election of 1865 Mill was returned to Parliament for Westminster, and till he lost his seat at the election of 1868 he acted with the advanced Radicals and urged the extension of suffrage to women. In 1851 he married Mrs. John Taylor, who had been an intimate friend long before her first husband's death. He ascribed to her influence many of his most cherished ideals; she died in 1859, but Mill's devotion to her memory was his religion till his death, which took place May 8, 1873, at Avignon, where he had spent the greater part of the last years of his life.

Mill became an author at a very early age and may be looked upon as one of the foremost thinkers of his time. His first publications consisted of articles in the *Westminster Review*. He took an active part in the political discussions that followed the revolution of 1830 in France and the reform-bill movement in England; and from 1835 to 1840 was editor and, along with Sir W. Molesworth, proprietor, of the *London and Westminster Review*, where many articles of his own appeared. His chief works are: *A System of Logic, Ratiocinative and Inductive* (1843; 9th ed., 1875); *Principles of Political Economy* (1848; ed. by Ashley, 1909); *On Liberty* (1859); *Discussions and Dissertations* (4 vols., 1859–74); *Utilitarianism* (1863); *Comte and Positivism* and the *Examination of Sir William Hamilton's Philosophy* (1865); *Inaugural Address at the University of St. Andrews* (1867); *England and Ireland* (1868); *The Subjection of Women* (1869); *Chapters and Speeches on the Irish Land Question* (1870). He also edited with copious notes his father's *Analysis of the Phenomena of a Human Mind* (London, 1869). After his death appeared his *Autobiography* (1873) and *Three Essays on Religion* (1874). A collected edition of his works appeared in 1905–10. Two volumes of his *Letters* also appeared in 1910. In philosophy he was an empiricist, sensationalist, and asso-

ciationalist. In ethics he was a utilitarian, but departed from the utilitarianism of Bentham by recognizing differences in quality as well as in quantity of pleasures. "It is quite compatible," he says, "with the principle of utility to recognize the fact that some kinds of pleasure are more desirable and more valuable than others. It is better to be a human being dissatisfied than a pig satisfied; better to be Socrates dissatisfied than a fool satisfied." Experience determines the rank of pleasures in the scale of quality; on this point he, perhaps unconsciously, follows Plato, assuming, contrary to fact, that experience gives the same valuation in all cases. In political theory Mill was a modified individualist, believing that every man should be allowed all liberty compatible with the liberty of his fellows. The tendency of modern thought has been so far away from individualistic standards that Mill's renown has been somewhat obscured, but his influence on his own generation would be difficult to overestimate. In metaphysics he followed the Humean tradition: the mind is "a series of feelings which is aware of itself as past and future," and matter is "the permanent possibility of sensations." His greatest work, however, was in logic, to which he added a fruitful treatment of the subject of induction (q.v.). His work in this science was considerably impaired by his sensationalistic empiricism, but when everything is taken into account, it must stand alongside that of Aristotle and of Hegel. His book was for many years the standard authority among those who shared his general standpoint in questions of philosophy, though it was keenly criticized from the opposite camp by Whewell and W. G. Ward.

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MILLAIS, mĭl-lā′, SIR JOHN EVERETT (1829–96). An English genre, landscape, and portrait painter. He was born at Southampton, June 8, 1829, and was brought up in the Isle of Jersey. In 1837 he received his first instruction in art from Bessel, a drawing teacher in Jersey. In 1838 and 1839 he studied at the School of Henry Sass in Bloomsbury, and the following years at the Royal Academy, in which he carried off every prize, receiving a gold medal in 1847. In 1848 he became associated with William Holman Hunt, Dante Gabriel Rossetti, and others in the formation of the Pre-Raphaelite Brotherhood (q.v.). His work attracted the attention of Ruskin, for whom he made some architectural designs and whose portrait he painted. In 1855 he married Ruskin's divorced wife. He was made associate member of the Royal Academy in 1853 and member in 1863. From 1860 to 1870 he was employed as illustrator, and among other books illustrated Tennyson's poems and Trollope's novels. He was appointed Officer of the Legion of Honor at the Paris Exposition in 1878 and was an honorary member of the French Institute and of several foreign academies. He was created Baronet in 1885, and a few months before his death, which occurred in London, Aug. 13, 1896, he was made president of the Royal Academy.

Aside from his landscapes and portraits, his subjects include scriptural, historical, and legendary themes, scenes from everyday life, and a few national in character, such as "The Rescue" (1855), painted in honor of the London firemen. From 1847 to 1853 his work was strongly influenced by Pre-Raphaelite theories and aroused much criticism. Works of this period are: "Isabella" (1849, Liverpool Gallery); "Christ in the House of his Parents" (1850) and "Ophelia" (1852, both in the Tate Gallery); "The Proscribed Royalist" (1853); "The Huguenot" (1852). After 1855 his work developed greater individuality and breadth, but lost in intensity, and his composition became more commonplace. His landscapes betray the ardent nature lover; his portraits are painted with masterly characterization. His art is forceful and robust, and his color brilliant. From 1870 on he gave much of his time to portrait painting, his sitters including Gladstone (National Gallery and Christ Church, Oxford); Leech, Lord Beaconsfield, Wilkie Collins, and Carlyle (all in the National Portrait Gallery); John Bright, Irving, Tennyson (Tate Gallery), and others. His landscapes include: "Spring" (1859); "Chill October" (1871); "The Vale of Rest" (1859, Tate Gallery); "Dew-Drenched Furze" (1881). Other important pictures are: "Eve of St. Agnes" (1863, water color, South Kensington Museum); "Effie Deans"; "The Black Brunswicker" (1860); "The Bride of Lammermoor" (1878) and "Portia" (both in the Metropolitan Museum, New York); "The Blind Girl" (1856, Birmingham Gallery); "The Northwest Passage" (1874); "The Order of Release" (1853); "The Boyhood of Raleigh" (1879); "A Yeoman of the Guard" (1877); "St. Stephen" (1895); "Speak! Speak!" (1895), and "A Disciple" (1895, all in the Tate Gallery).

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MILLAIS, JOHN GAILLE (1865–). An English artist and naturalist, born in London, a son of Sir John Everett Millais. He was educated at Marlborough and at Trinity College, Cambridge, and from 1886 to 1892, when he retired as first lieutenant, served in the

Seventy-second Highlanders. He shot big game in all parts of the world and made a remarkably large collection of British birds. Besides illustrating books on shooting and natural history, especially the *Encyclopædia of Sport*, to which he contributed, he wrote: *Game Birds and Shooting Sketches* (1892); *A Breath from the Veldt* (1895); *British Deer and their Horns* (1897); the *Life and Letters* (1899) of his father; *The Wild Fowler in Scotland* (1901); *British Surface-Feeding Ducks* (1902); *The Mammals of Great Britain and Ireland* (3 vols., 1904–06); *Newfoundland and its Untrodden Ways* (1907); an elaborate and beautifully illustrated *Natural History of British Game Birds* (1909); *British Diving Ducks* (1913); *Deer and Deer Stalking* (1913).

MILLAR, Andrew (1707–68). A London publisher and bookseller, of whom Dr. Johnson said: "I respect Millar, sir; he has raised the price of literature." It was he who, with other aid, financed Johnson's *Dictionary* and saw it through the press. Among his notable publications were Thompson's *Seasons*, Fielding's *Tom Jones* and *Amelia*, and the histories of Robertson and Hume. Consult Charles Knight, *Shadows of the Old Booksellers* (London, 1865).

MILLARD', Evelyn (1873–). An English actress, born in London, the daughter of a professor of elocution. She made her début at the Haymarket in 1891 and in the same year played in Sarah Thorne's stock company and in repertoire with Fred Thorne's company. Then she was at the Adelphi (through 1893); played Paula in *Mrs. Tanqueray;* with Comyns Carr as Rosamund in *Sowing the Wind* (1895); at the St. James's (1894–96), playing Cecily Cardew in Wilde's *The Importance of Being Earnest* and Princess Flavia in *The Prisoner of Zenda;* and at Her Majesty's (1896) she created the rôle of Mademoiselle de Belle Isle in 1897. She was Portia in Beerbohm Tree's production of *Julius Cæsar* (1898); Glory Quayle in Hall Caine's *Christian* (1899); Francesca in Stephen Phillip's *Paolo and Francesca* (1902); the Countess de Roquelaure in Doyle's *Brigadier Gerard* at the Lyric (1906); and Joanna Rushworth in *The Beloved Vagabond* at His Majesty's (1908). In 1908 she managed the Garrick. She married Robert Porter Coulter in 1900.

MILLAU, mē'yō', or **MILHAU.** A town in the Department of Aveyron, France, on the Tarn, 74 miles north of Béziers (Map: France, S., G 4). Its chief building is the Romanesque church of Notre Dame, with a sixteenth century tower. There is a large botanical garden and parks. The town is the centre of a cattle-raising and grape-growing section and has a variety of manufactures, particularly of kid gloves, woolen goods, and dyed goods. There are oil wells near by. Millau was the Roman Æmilianum Castrum; during the religious wars it was a stronghold of Calvinism, and Louis XIII destroyed its ancient castle and walls in 1629. Pop. (commune), 1901, 18,701; 1911, 17,673.

MILL'BANK PRISON. A famous London penitentiary in Westminster, facing the Thames. It was built in 1812 (finished in 1821) in accordance with the plans of Howard and Bentham. It could shelter 1100 inmates and was so constructed that from a central room every cell could be seen. The confinement was solitary. Those sentenced to penal servitude served a term here first. The prison was closed in 1890 and the buildings torn down in 1891. Consult G. P. Holford, *Account of the General Penitentiary at Millbank* (London, 1828), and A. Griffiths, *Memorials of Millbank* (2d ed., ib., 1894).

MILL-BOY OF THE SLASHES. A popular nickname of Henry Clay, from a tract of swampy land called the Slashes near his birthplace in Hanover Co., Va.

MILL'BURY. A town in Worcester Co., Mass., 6 miles southeast of Worcester, on the Blackstone River and on the New York, New Haven, and Hartford and the Boston and Albany railroads (Map: Massachusetts, D 4). It has a public library and is extensively engaged in the manufacture of cotton and woolen goods, edge tools, foundry and machine-shop products, loom harness and heddles, linen cloth and thread, and felt goods. From 1743 to 1813, when it was incorporated, Millbury was the north parish of Sutton. The lyceum lecture system is said to have originated here about 1820. Pop., 1900, 4460; 1910, 4740.

MILLE, mēl, Pierre (1864–). A French journalist and author, born at Choisy-le-Roi and educated at the Collège Rollin. He was sent to Madagascar on several missions; was war correspondent for the *Journal des Débats* during the Græco-Turkish War in 1897; and traveled widely. He was created a Knight of the Legion of Honor. Among his writings are: *De Thessalie en Crète* (1898); *Au Congo belge* (1899); *Sur la vaste terre* (1906); *La biche écrasée* (1910); *Caillou et Tili* (1911); *Louise et Barnavaux* (1912).

MIL'LEDGE, John (1757–1818). An American soldier and statesman, born in Savannah, Ga. When the Revolution began he was one of the party which seized Wright, the royal Governor of the Colony. Milledge escaped from Savannah when it was taken by the British in 1778, and he assisted in the unsuccessful siege of the town by the Americans in 1779. In the following year he was made Attorney-General of Georgia. After the war he was several times elected a member of the State Legislature, and was a Representative in Congress from 1792 to 1798 and again from 1801 to 1802, when he resigned to become Governor. In 1802 he was one of the three commissioners who negotiated the cession of Georgia's western territory to the United States. From 1806 to 1809 he was a United States Senator. Milledge took an active part in establishing the University of Georgia, and gave the institution 700 acres of land, upon which the university and a part of Athens now stand. The town of Milledgeville was named in his honor.

MIL'LEDGEVILLE. A city and the county seat of Baldwin Co., Ga., 32 miles northeast of Macon, on the Oconee River, at the head of navigation, and on the Georgia and the Central of Georgia railroads (Map: Georgia, C 2). It is the seat of the Georgia Military College and the Georgia Normal and Industrial College for Girls and of the Georgia State Sanitarium for the Insane, which accommodates 4000 patients. The prison farm, 3 miles northwest of the city, employs some 400 State convicts. The city is the centre of a cotton-growing region and its industrial interests are mainly in the preparation of this staple for market, and in the manufacture of brick, tile, cement, and sewer pipe. The government, under a charter of 1900, is administered by a mayor, elected every two years, and a unicameral council, of which the mayor is a member, chosen on a general ticket. Mil-

ledgeville, named in honor of Gov. John Milledge of Georgia, was laid out in 1803, was chartered as a city in 1836, and was the capital of the State from 1807 to 1867, the government buildings now being utilized by the colleges. Pop., 1900, 4219; 1910, 4385.

MILLENA'RIANS. See MILLENNIUM.

MIL'LENARY (Lat. *millenarius*, containing a thousand, from *milleni*, a thousand each, from *mille*, thousand). A period of a thousand years, specifically the celebration of the one-thousandth anniversary of any event. The most important millenary was that commemorating the death of Alfred the Great, which was held in Winchester, England, Sept. 18–21, 1901, which culminated in the unveiling of a large bronze statue of King Alfred by Hamo Thornycroft.

MILLENARY PETITION. A petition presented by Puritan clergy to King James I in April, 1603, when on his way to London to take his throne. It is so called because it was intended to have 1000 signatures, although as a matter of fact it had only 750. The original of the petition is supposed to be lost, but Fuller gives it in his *Church History* (Book x, 27, ed., London, 1837, vol. iii), and it is thence reprinted by Gee and Hardy, *Documents Illustrative of English Church History* (London, 1896; pp. 508–511). It sets forth in firm but respectful language those points connected with the Church service (cross in baptism, baptism by women, public reading of the Apocrypha, unabridged liturgy, etc.), the Church ministry (illiterate ministers, nonresidency, clerical celibacy), the Church revenue (commendams, pluralities, impropriations), and with the Church discipline (excommunications for trifling causes, extortionate fees, protracted ecclesiastical suits, frequency of marriages without banns asked), which the Puritan party would see removed or modified. The King's answer was the calling of the Hampton Court Conference in January, 1604, which resulted in no redress, but rather the confirmation of the abuses complained of, but which led to the preparation of the Authorized Version of the Bible.

MILLEN'NIUM (Neo-Lat., from Lat. *mille*, thousand + *annus*, year). A period of 1000 years preceding the final judgment (q.v.), during which, according to a widely accepted system of Christian eschatology, the Christ and his saints will reign on the earth. The division of the world's course into periods is found among many peoples. Thus, the Hindus divided the history of the world into *kalpas* of hundreds or thousands of years, and the Incas made four great periods. (See ESCHATOLOGY.) A long national existence and a tradition of certain epoch-making events naturally account for such a partition. The Persians counted 12 periods each of 1000 years. It is likely that this division into 12 parts was derived from the Babylonians, and ultimately goes back to calculations of the sun's course through the 12 signs of the zodiac. It is significant that the third, fourth, fifth, sixth, seventh, and eighth thousand years are attributed respectively to Cancer, Leo, Virgo, Libra, Scorpio, and Sagittarius in *Bundahish* 34. The number 1000 may have a different origin, since the great cosmic year would demand a larger figure. According to the Parsi doctrine, 6000 of the 12,000 years are occupied by the history of man. Zarathustra appears at the beginning of the fourth and the Saoshyant will come at the end of the last to raise the dead and to renew the world. While this doctrine is fully presented only in late Pahlavi writings, such as the *Bundahish* and the *Dinkart*, there are indications of a much higher age, as Mani (c.200 A.D.) was familiar with the Zoroastrian doctrine of a cycle of 12,000 years, and Berosus (c.300 B.C.) seems to have rationalized the doctrine of *Zrvan akarana*, boundless time, and its period. It is altogether probable that the conception that human history would endure 6000 years before the Messianic age came into Jewish thought from a Persian source. The scriptural justification was found in Ps. xc. 4, "A thousand years in thy sight are but as yesterday when it is past," and the length of the Messianic age was inferred from an interpretation of Gen. ii. 2, based on the word of the Psalmist, as is seen by utterances of rabbis living in the second century A.D. (*Midrash Tehillim* to Ps. xc and *Yalkut Shimeoni* to Ps. lxxii.) Before the fall of Jerusalem in 70 A.D. there is no evidence that the expected Jewish world empire, whether with or without a Messiah, was thought of as being of limited duration. That Israel would never yield its supremacy to any other nation was a firm conviction. The Messianic King was probably looked upon as the founder of a dynasty. Towards the end of the first century, however, the conception of the Messiah became more transcendent, and his reign might be thought to last "until the corruption of the world should end," characterized by great prosperity (*Apocalypse of Baruch*, xl. 3, xxix, lxxiii), or, more precisely, 400 years to be followed by seven days of silence, the general resurrection, and the last judgment (q.v.) as set forth in the *Apocalypse of Ezra* (vii. 28, 29). The first mention of the millennium is in the *Slavonic Enoch* (xxxii. 2–xxxiii. 2); but in this book there is no Messiah. A summary of opinions in the Babylonian Talmud (Sanhedrin 97a, 99a) shows that it was comparatively seldom that a Jewish teacher estimated at 1000 years the length of Yahwe's reign, 40, 70, 365, 400, 600, 2000, and 7000 years being suggested by different teachers.

In the New Testament the doctrine of a millennium is clearly taught in Rev. xx. After the returned Messiah has conquered the beast, Satan is cast into the abyss in chains for 1000 years, the martyrs are raised from the dead and reign with Christ as kings and priests during the millennium. At the end of the millennium the powers of evil are let loose again for a short time, whereupon follow the resurrection of the rest of the dead, the last judgment, the destruction of death and Hades, which is the second death, and the new heavens and the new earth. Critical exegesis agrees with the Chiliasts of the early Church and the present premillenarians that the author of this passage no doubt believed that Jesus would return upon the clouds before the millennium to reign with some of his saints for 1000 years in visible form. It cannot be proven, however, that other writers in the New Testament cherished this view, or that they all held the same opinion concerning the world's future. The Gnostics rejected this doctrine and their opposition was continued by such teachers of the Alexandrian school as Clement and Origen. On the other hand, Irenæus informs us (*Adv. Haer.*, v, 33) that Papias, Bishop of Hierapolis, had recorded as a saying of Jesus a remarkable description of the fertility of the vine in the millennium; the epistle attributed to Barnabas describes the millennium as a period of

rest following 6000 years of work to be ushered in by the return of Christ (xv, 5); and Justin Martyr likewise expressed his belief in the premillennial coming of Christ and the thousand years of his reign in Jerusalem (*Apol.* 52; *c. Tryph.* 45, 49, 113). Irenæus, Tertullian, and Hippolytus were also Chiliasts. An ardent expectation of the millennial kingdom characterized the Montanists, who looked for its establishment at Pepuza in Phrygia. The reaction against Montanism led to a more general rejection of the doctrine of a millennium. Dionysius of Alexandria attacked the very foundation of this doctrine in denying the Johannine authorship of Revelation. Such doubts did not disturb the Western Church, and men like Commodian and Lactantius were Chiliasts. Only through the influence of Jerome and especially Augustine, whose *Civitas Dei* identified the Church with the kingdom of God and the millennium with the history of the Church, did Latin Christianity commit itself to an eschatological programme excluding the premillennial advent, the first resurrection, and the visible reign on earth. During the Middle Ages earnest and spiritually minded men, grieved at the many abuses that spread in the Church, could not but look for divine chastisement. While there does not seem to be sufficient foundation for the current statement that the end of the world was generally expected about the year 1000 A.D., there are many indications of the anxiety that at sundry times filled pious hearts as well as guilty consciences. The great hymn *Dies iræ, dies illa* reveals both a fearful looking forward to the impending judgment and the part that the Sibylline Oracles and similar works played in creating this mood. Millenarian views were held by men like Joachim of Floris and Occam and by numerous religious bodies. In the Reformation era the hope of a speedy establishment of the Messianic kingdom was especially cherished by many of the Baptists. They were led to it by their doctrine of the inner light and the continuance of prophecy, by their sympathy with the oppressed, and by their disapproval of the union of church and state. Looking to God alone for the establishment of the truth and the righting of social wrongs, and expecting a direct revelation from Him, some naturally were led astray by their impulses under pressure of circumstances. But the establishment of the millennial kingdom by John of Leyden (q.v.) at Münster was an error regretted and condemned by the great majority of Baptists. The Fifth Monarchy men of Cromwell's time looked upon the millennium as having actually begun with the overthrow of the royal family in England. Many English mystics looked forward to the second advent in the year 1666, and their faith found a curious reflection even in Judaism. (See MESSIAH.) Chiliastic views were embraced by Comenius, who translated into Latin a number of recent prophecies as to the end of the world, Jurieu, Spener, and other pietists. Swedenborg held that the millennial dispensation began in 1757. Bengel calculated that the millennium would commence in 1836; Miller expected it in 1843; Channing in 1867; Baxter in 1881. While some premillenarians devote much attention to prophetic chronology, assuming a double fulfillment of the predictions in Daniel and Revelation, others refrain from all attempts at fixing the date, but are obliged by the natural interpretation of Rev. xx, with their view of biblical infallibility, to affirm the visible coming of Christ before the millennium. Among the latter are many learned theologians of recent times. The opinion that this visible coming of Christ will occur after a long period of universal prevalence of Christianity supposed to be vaguely indicated by the thousand years is more widely accepted, but it is further removed from the conceptions of early Christianity and cannot readily find the scriptural support that it demands. The distinction between premillennialism and postmillenialism is rapidly losing its significance, as modern theology has a tendency to look upon the primitive Christian expectation of the return of Jesus as an illusion, historically necessary, but not of permanent worth; to consider the absolute victory of one system of religious faith and practice less desirable than the ascendancy of what is morally most excellent in all creeds and cults; and to expect a gradual improvement of the social conditions and the character of the human race to be wrought by actually operating forces.

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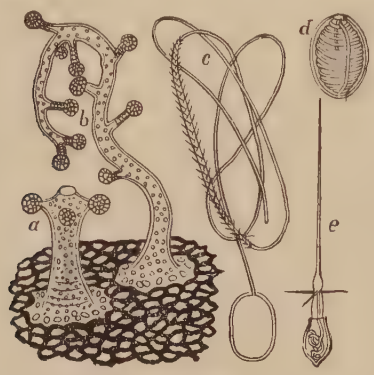
MIL'LEPORE (from Lat. *mille*, thousand + *porus*, passage, pore). A coral-forming hydroid, of the order Hydrocorallina, so named from the numerous minute pores or calicles dotting its surface, which are arranged in irregular circular groups. As the single animal is microscopic, and as it grows in compound coral-like masses on reefs in tropical seas, it was at first confounded with the corals, but was eliminated from the corals first by L. Agassiz and afterward by Moseley. The animal is not a coral polyp, being allied rather to *Hydra*, and especially to *Hydractinia* and *Clava*, common on northern coasts. The coral stocks form irregular branching masses, several inches high and sometimes a

foot or more broad. The mass of the coral incrustation consists of fibres (canals or tubes) traversed in all directions by tortuous spaces forming regular branching systems, like a tree, in which *Millepora* differs from the coral stocks (coralla). The animals are of two kinds. Those inhabiting the central cup or pore are short thick zoöids. (See POLYMORPHISM.) These are the "feelers"—they take in the food. The zoöids in the smaller, outer pores of the circle are the reproductive zoöids. That *Millepora* is a true hydroid is proved by the coral stock being at the base provided with canals by which the several zoöids are kept in union with one another by the form of the zoöids themselves, by the absence of all trace of mesenteries (which characterize coral polyps), and by the presence



MILLEPORE.

Animal of *Millepora nodosa*. *a*, nutritive zoöid; *b*, reproductive zoöid; *c*, lasso cell; *d*, the same coiled up in its cell; *e*, a third form. (All highly magnified.)

of thread cells (see NEMATOCYST) of the form peculiar to hydroids. Finally, the position of *Millepora* as a hydroid has been satisfactorily settled by the discovery, by Duerden in 1899, in Jamaica, of free-swimming female medusæ. (See HYDROZOA.) The Floridian and West Indian species is *Millepora alcicornis*. Consult articles by L. Agassiz, Moseley, Duerden, in *Nature* (London, 1899–1900). See Plate of CORAL.

MILLER, ADOLPH CASPAR (1866–). An American economist, born in San Francisco. He graduated from the University of California in 1887 and from Harvard (A.M.) in 1888 and studied at Paris and Munich in 1895–96. He was instructor in economics at Harvard in 1889–90, assistant professor of history and politics at the University of California in 1890–91, associate professor of political economy and finance at Cornell in 1891–92, professor of finance at Chicago from 1892 to 1902, and Flood professor of economics and commerce at the University of California in 1902–13. In the latter year he became assistant to the Secretary of the Interior at Washington and in 1914 he was appointed by President Wilson a member of the newly created Federal Reserve Board. He published *The Monetary Problem in the United States* (1895).

MILLER, CHARLES (1843–). An American capitalist and philanthropist, born at Oberhoffen, Alsace. He came to the United States in 1854; entered the oil business in 1869; and became president of the Galena-Signal Oil Company and director of the American Locomotive Company, the American Steel Foundry Company, the Railway Steel Spring Company, and about 40 other corporations. He served as mayor of Franklin, Pa., for two terms, as member of the Pennsylvania State Board of Charities for six years, and as major general in the Pennsylvania National Guard in 1900–06. He maintained a night school at Franklin, and was made a Chevalier of the French Legion of Honor.

MILLER, CHARLES HENRY (1842–1922). An American landscape painter, born in New York City. He first studied to be a physician, but gave up this profession for art. After studying in Vienna and Berlin he went to Munich in 1867 and became a pupil of Lier and of the Bavarian Academy. Afterward he settled in New York, where he became an Academician in 1875 and one of the first members of the Society of American Artists. He belongs to the older school of American painters. His best canvases include "Sunset, East Hampton" (1878, Brooklyn Museum); "Bouquet of Oaks" (Metropolitan Museum, New York); "High Bridge" (Democratic Club, New York). He wrote *The Philosophy of Art in America* (1885) under the pen name of Carl de Muldor.

MILLER, CHARLES RANSOM (1849–1922). An American newspaper editor. He was born at Hanover, N. H., and graduated from Dartmouth College in 1872. He served on the staff of the Springfield *Republican* in 1872–75, and then joined the staff of the New York *Times*, becoming an editorial writer in 1881 and editor in chief in 1883. He also became vice president and director of the New York Times Company. In 1913 he was special lecturer at the Columbia School of Journalism. He received the honorary degree of LL.D. from Dartmouth in 1905, and that of Litt.D. from Columbia in 1915. His brilliant leader of Dec. 15, 1914, "For the German People, Peace with Freedom," demanding the overthrow of German militarism, was widely commented on at home and abroad, and, in general, the editorial page of the *Times* was maintained under his direction at a high level of excellence during a long period.

MILLER, CINCINNATUS HEINE, better known as JOAQUIN MILLER (1841–1913). An American author, born in Wabash District of Indiana, Nov. 10, 1841. In 1854 his parents took him to Oregon. Later he became a gold miner in California. He was a volunteer in Walker's Nicaragua expedition of 1855. From 1855 until 1860 he lived among the Indians of the Pacific coast. He studied law for a while, then edited at Eugene, Oreg., a Democratic paper, which was suppressed by the authorities for disunion sentiments. In 1863 he began to practice law and in 1870 he was appointed county judge of Grant Co., Oreg. After visiting the Eastern States Miller went to England, where (and also in Boston) in 1871 he published his *Songs of the Sierras*, which made him a "lion" in London society. In London he lived up to the British conception of the American Western type by appearing on festal occasions and in general in flannel shirt, sombrero, etc. He afterward settled in New York, but left that city in order to do journalistic work in Washington, D. C., and in Oakland, Cal. At his Oakland home, which was a feature of the city, he entertained many visiting celebrities. He died Feb. 17, 1913. In accordance with his wish his body was cremated and the ashes carried up into the Sierras and thrown to the winds. In addition to the *Songs of the Sierras* above mentioned, his

work includes: *Songs of the Sunlands* (1873); *Songs of Italy* (1878); *Songs of the Mexican Seas* (1887); *Building of the City Beautiful* (1893); in prose, *The Danites in the Sierras* (a novel, 1881). Miller's play, *The Danites*, taken from his novel, had considerable success, and his poetry received some favorable notice, more for genuinely romantic content and brilliant if crude color, than for artistic excellence. A collective edition of his verses appeared in 1897. The name Joaquin is supposed to have been taken from Joaquin Murietta, a Mexican bandit, of whom Miller wrote a defense. In the *Poems* (6 vols., San Francisco, 1909–10) will be found (in volume i) an introduction and an autobiography.

MILLER, Edward (1760–1812). An American physician, born in Dover, Del. He graduated from the medical department of the University of Pennsylvania in 1784 and in 1797, associated with Dr. Samuel L. Mitchell (q.v.) and Dr. Elihu H. Smith, he founded the *Medical Repository*, the first American journal of medicine. He was professor of the practice of medicine in the University of the City of New York in 1807–12. His report on "Yellow Fever in New York in 1805" remains a notable contribution to medical science. He enjoyed a high reputation both in the United States and abroad. Consult Samuel Miller, *Memoir and Writings of Edward Miller* (New York, 1814).

MILLER, Ferdinand, Baron von (1842–). A German bronze founder and sculptor. He was born in Munich and studied under his father, Ferdinand von Miller (q.v.), and later with Hähnel in Dresden. For purposes of work and study he traveled extensively in France, Italy, and America. As lieutenant he served in the Franco-German War of 1870–71. In 1900 he was appointed director of the Bavarian Academy of Fine Arts and in 1912 he was made Baron. He cast upward of 70 colossal monuments, scattered throughout the world. His own work in sculpture includes statues of Humboldt, Shakespeare, and Columbus for St. Louis; figures for a large fountain at Cincinnati; the statue of a soldier for the Soldiers' Monument in Charleston; the equestrian statue of Emperor William I at Metz (1892); and, among many others in Bavaria, the army monument in the Feldheerenhalle at Munich and the equestrian statue of King Louis I at Regensburg (1902).

MILLER, Ferdinand von (1813–87). A German bronze founder, born at Fürstenfeldbruck. He studied at the Munich Academy and learned his trade under his uncle, Stiglmayer, and in Paris with Soyer. His reputation was won by his castings from the designs of Schwanthaler, and especially by his monumental works, including the colossal statue of "Bavaria" in Munich and of the "Germania" of the Niederwald monument. His best-known work in America, where he executed over 80 commissions, is the bronze door of the Capitol in Washington. His sons, Ferdinand (q.v.) and Ludwig (1850–1912), also became bronze founders and sculptors.

MILLER, Frank Augustus (1859–). An American art collector and antiquarian, born in Tomah, Wis. He removed in 1872 to California and in 1879 founded at Riverside the Glenwood Mission Inn. This he subsequently enlarged from time to time, using always and with rare artistic taste distinctive architectural features of the mission buildings erected in that region during the eighteenth and early nineteenth centuries by Franciscan padres. The resulting edifice has been considered the most consistent and beautiful example of mission architecture in existence. Here Miller gathered from Spain, and elsewhere in Europe, as well as from California and Mexico, a large and interesting collection of bells and other objects of artistic worth and historic significance, reminiscent chiefly of the old Spanish missions in America.

MILLER, George Abram (1863–). An American mathematician, born at Lynnville, Pa. He graduated from Muhlenberg College (Pa.) in 1887 and from Cumberland University (Ph.D.) in 1893 and studied later at Leipzig and Paris. He was principal of schools at Greeley, Kans. (1887–88); taught mathematics at Eureka (Ill.) College (1888–93), the University of Michigan (1893–95), Cornell (1897–1901), and Leland Stanford (1901–06). In 1906–07 he was associate professor and thereafter professor of mathematics at the University of Illinois. He taught also in the summer schools of the universities of Chicago (1912) and California (1913); became editor of the *American Mathematical Monthly* and of *School Science and Mathematics;* was coeditor of the *Encyclopédie des Sciences Mathématiques;* and is author of *Determinants* (1892) and coauthor of *Mathematical Monographs* (1911).

MILLER, Henry (1800–74). An American physician, born at Lexington, Ky. After a short residence in Glasgow and Harrodsburg (both in his native State) he removed to Louisville upon the organization there of a new school of medicine. In this institution he held the chair of obstetrics and diseases of women and children until 1869. In 1859 he was president of the American Medical Association. Miller is author of *Treatise on Human Parturition* (1849) and *The Principles and Practice of Parturition* (1858).

MILLER, Henry (1860–). An American actor and theatrical manager. He was born in London, but when 11 came to America with his parents and settled in Toronto, Canada, where he received a public-school education and made his first appearance on the stage in 1879. After a brief experience in Modjeska's company he came to New York in 1880 and appeared in minor Shakespearean rôles at the Booth Theatre with Adelaide Neilson. Six years later he joined Daniel Frohman's Lyceum Company and became leading juvenile. His best-known early rôles were Clément Hale in *Sweet Lavender* (1888), Colonel Kerchival West in *Shenandoah* (1889), and Claude Melnotte in *The Lady of Lyons* (1890). In 1893 he became a member of Charles Frohman's Empire Theatre Stock Company and remained there as leading man till 1896, playing among other parts John Worthing in *The Importance of Being Earnest* and Michael Faversham in *Michael and his Lost Angel*. After leaving the Empire company he made his first appearance as a star at the Garden Theatre, New York, in 1897. In 1903 he joined Margaret Anglin in a series of co-star performances, playing Dick Dudgeon in *The Devil's Disciple*, Armand Duval in *Camille*, and (in 1906) Stephen Ghent in William Vaughan Moody's *The Great Divide*. After touring America he made his first appearance in England in this last play in 1909. Thereafter he appeared in vari-

ous plays under his own management, including *The Rainbow* (1912) and *Daddy Long-Legs* (1915). Jointly with J. Hartley Manners (q.v.) he wrote *Zira*, and in it played the leading part (1906).

MILLER, Hugh (1802–56). A Scottish geologist and writer, born in Cromarty. He was brought up by two uncles, his father having been drowned when Hugh was five. From his seventeenth to his thirty-second year he worked as a stonemason and from 1834 to 1840 was a bank accountant. In 1829 he published a volume entitled *Poems Written in the Leisure Hours of a Journeyman Mason.* He also made researches in Scottish antiquities, contributed to John M. Wilson's *Tales of the Borders* (1834), and wrote *Scenes and Legends of the North of Scotland* (1835; 3d ed., 1853). However, his studies were mainly geological. His series of articles in this field, collected as *The Old Red Sandstone, or New Walks in an Old Field* (1841; 7th ed., 1907), first appeared in the Edinburgh *Witness*, a paper of which Miller had become editor a year earlier. These articles discussed the author's discovery of fossils in a formation where they had not been thought to exist. His editorial labors during the heat of the disruption struggle so seriously injured his health that for the larger part of 1845–46 he had to give up all literary activity. He resumed the editorship of the *Witness*, which, from 1845, when Robert Fairby and he became joint owners, ceased to represent the Free church. Miller killed himself while insane. His services to science were important, his observation being keen and exact. He was a pioneer in the popularizing of geology. His principal works, besides those already mentioned, are: *First Impressions of England and its People* (1846; 3d ed., 1853), containing many fine specimens of English descriptive prose; *Footprints of the Creator, or the Asterolepis of Stromness* (1847; 3d ed., 1850), designed as a reply to the *Vestiges of the Natural History of Creation; An Autobiography: My Schools and Schoolmasters, or the Story of my Education* (1852); *Testimony of the Rocks* (1857), an attempt to reconcile the geology of Genesis with that of nature. Consult Peter Bayne, *Life and Letters of Hugh Miller* (2 vols., Boston, 1871).

MILLER, James (1776–1851). An American soldier and politician, born at Peterboro, N. H. He was educated for the bar, but in 1808 entered the United States army as major and took part in the frontier warfare, where he displayed great skill and courage. In 1812 he was brevetted colonel for gallantry in the engagement at Brownstown, where he commanded, and in 1814 took part in the Canadian invasion as colonel of the Twenty-first Infantry. In the battles of Chippewa and Lundy's Lane he did substantial service. A gold medal was presented to him by Congress and he was promoted to the rank of brigadier general. In 1819 he resigned from the army. From 1819 to 1825 he was Governor of Arkansas, then a Territory; and from that time until 1849 was collector of the port of Salem, Mass.

MILLER, Joaquin. See Miller, Cincinnatus Heine.

MILLER, Johann Martin (1750–1814). A German poet, member of the Göttinger Bund. He was born at Ulm, studied theology at Göttingen, and there made the acquaintance of Voss, the idyllist and translator of Homer, and of Hölty, the lyrist. He contributed to the Göttingen *Almanach* poems which became very popular, especially "Was frag' ich viel nach Geld und Gut." But he is better known for *Siegwart, eine Klostergeschichte* (1776), a sentimental novel, the best of the imitations of Goethe's *Werther*, largely autobiographic and very didactic. His other fiction includes: *Beitrag zur Geschichte der Zärtlichkeit* (1776); *Briefwechsel dreier Freunde* (1776–77); *Geschichte Karls von Burgheim und Emiliens von Rosenau* (1778–79). A collected edition of Miller's poems appeared in 1783 and an autobiography in 1803. Consult Kraeger, *Johann Martin Miller* (Bremen, 1893), and Erich Schmidt, *Charakteristiken*, vol. i (2d ed., Berlin, 1902).

MILLER, John Franklin (1831–86). An American soldier and politician, born in South Bend, Ind. He took a course at the New York State Law School, graduating in 1852, and was elected a Republican member of the Indiana Senate in 1860, but resigned in order to enter the army on the outbreak of the Civil War. He was made colonel of the Twenty-ninth Indiana Volunteers and fought in many of the most important battles in the Mississippi region. For gallantry at the battle of Stone River he was made a brigadier general of volunteers. At Liberty Gap he was severely wounded, but he commanded a division at Nashville and was soon afterward brevetted major general of volunteers. Soon after the war he removed to San Francisco and was for four years collector of the port. He then entered business and was one of the originators and also president of the Alaska Commercial Fur Company. He took an active part in politics, was several times a presidential elector on the Republican ticket, in 1879 assisted in framing a new State constitution, and in 1881 was elected United States Senator from California and served until his death.

MILLER, Joseph, or Josias, commonly known as Joe Miller (1684–1738). An English comedian. With slight interruption he was connected with Drury Lane from 1714 to his death. Great favorites with the town were his Teague in Sir Robert Howard's *Committee* and Sir Joseph Wittol in Congreve's *Old Bachelor.* He was also popular in a score of other rôles. So ignorant that he was unable to read, he married that he might have some one to read his parts to him. Though he had no great reputation as a wit off the stage, yet the year after his death appeared a volume of jests ascribed to him under the title *Joe Miller's Jests.* This pamphlet of 72 pages, containing 247 jests, was compiled by John Mottley for the publisher, T. Read. Why it was fathered upon a poor and illiterate actor is not clear; perhaps by mere accident. The jests are taken in part from earlier collections and in part from current witticisms that had not previously found their way into print. Only three are related of Miller himself. As a whole they are flat; their only piquancy is in their coarseness. But they were exceedingly popular, as is shown by the numerous editions that immediately followed (1st, 2d, 3d, 1739; 4th, 1740; 5th, 1742; 6th, 1743; 7th, 1744; 8th, 1745). The original number of jests, which had increased to 587 in the edition of 1745, continued to grow, until by the middle of the nineteenth century it had reached 1546. Consult the facsimile reprint of the first editions by Bellars (London, 1861) and Hazlitt, *Studies in Jocular Literature* (ib., 1890).

MILLER, Joseph Nelson (1836–1909). An American naval officer, born in Ohio. Entering the navy in 1851, he became commander in 1870, captain in 1881, commodore in 1894, and rear admiral in 1897. As executive officer on board the ironclad *Passaic* he was present at the attack upon Fort Sumter in 1863, and for bravery in this and the action against Fort Fisher was highly commended. He represented the Navy Department at the Queen's Jubilee in 1897, in 1898 raised the flag of the United States over Hawaii, and at the time of the Spanish-American War organized the Pacific naval reserves. In November, 1898, he was placed on the retired list.

MILLER, Lewis (1829–99). An American philanthropist and inventor, born at Greentown, Ohio. He invented and manufactured a mower and reaper and other agricultural machines, which brought him a large fortune. He devised an auditorium for Sunday schools and introduced into Sunday-school services new instrumental music, such as that of piano and cornet. His experience and ideas in the development of religious organization in 1873 suggested to Bishop John H. Vincent the plan of the Chautauqua Assembly, which was adopted, and Miller became president of the Assembly after its foundation the next year. He gave largely to the support of the Assembly and to other enterprises.

MILLER, Orest Fedorovitch (1833–89). A Russian literary historian and critic, born in Reval. He studied at the University of St. Petersburg (1851–55) and was professor of early Russian literature there until 1888. His important lectures on *Russian Literature after Gogol* were published in 1874 and his *Slav World and Europe* in 1877. Though a prominent Slavophil, he was less radical than some writers, as is shown by his book on the Slav question (1865). He also wrote *Lomonosov and Peter the Great* in the following year, but became most widely known through his work on the national mythology, entitled *Ilĭa Muromets i Bogartyrsvo Kievskoe* (1870).

MILLER, Patrick (1731–1815). A Scottish inventor, who is asserted by some first to have invented the steamboat. He was born in Glasgow, became a banker, and having accumulated a considerable property, interested himself in maritime inventions. In 1785 he bought the estate Dalswinton in Dumfriesshire and there conducted some experiments with a steamboat of his construction which was propelled by a Symington (q.v.) engine. In 1787 he published a description of one of his vessels under the title *The Elevation, Section, Plan, and Views of a Triple Vessel with Wheels, etc.* Miller was a close friend of Robert Burns. Consult Major General Miller, *A Letter to Bennet Woodcroft Vindicating the Right of Patrick Miller to be Called the First Inventor of Practical Steam Navigation* (London, 1862).

MILLER, Richard E. (1875–). An American figure painter. He was born in St. Louis and studied at the School of Fine Arts there (1885–89) and in Paris under Constant and Laurens (1899–1901). The first picture which he exhibited in the Paris Salon (1901) won a gold medal, and he continued to achieve distinction at the Salon. He made Paris his residence; became a Chevalier of the Legion of Honor (1908), a member of the International Society of Painters, Sculptors, and Gravers and of the Society of American Painters, Paris, and was elected an associate of the National Academy of Design, New York. He is represented in the Luxembourg Gallery, Paris, by the "Old Maiden Ladies" and "Portrait of an Old Woman"; in the Metropolitan Museum of Art, New York, by "The Chinese Statuette"; the Gallery of Modern Art, Rome, "Lady with Fan"; Corcoran Gallery, Washington, "The Boudoir"; and also in the permanent collections of St. Louis, the Carnegie Art Institute, Pittsburgh, the Antwerp Museum, Musée du Petit Palais, Paris, Museum of Christiania, and the modern galleries of Florence and Venice. Among his more recent works are "Springtime," "Before the Mirror" (1913), "La Toilette" (1914), "The Open Window" (1914). Miller became one of the most prominent and influential among American painters residing abroad. His highly modern technique shows impressionistic influence, with delightful color schemes and very subtle and interesting treatment of light and shadow. He excels especially in figure compositions, depicted either out of doors or in rooms flooded with light. Quaint eighteenth-century costumes often add to the charm of his paintings.

MILLER, Samuel Freeman (1816–90). An American jurist. He was born in Richmond, Ky., graduated in medicine at Transylvania University in 1838, and afterward studied law and removed in 1850 to Iowa, where he became conspicuous in his profession. He ardently supported emancipation of the slaves and became a prominent member of the newly founded Republican party. In 1862 he was appointed an associate justice of the United States Supreme Court by President Lincoln. His decisions gave him a national reputation, and he was especially noted for his opposition to the encroachments of railroad corporations. In 1877 he was a member of the Electoral Commission and in 1887 was the orator of the Centennial Constitution celebration held at Philadelphia.

MILLER, Warner (1838–1918). An American politician and manufacturer, born at Hannibal, Oswego Co., N. Y. He graduated at Union College in 1860. At the beginning of the Civil War he enlisted in the Fifth New York Cavalry and was promoted to be lieutenant. After leaving the army he became a paper manufacturer at Herkimer, N. Y., and in this business he accumulated a fortune. In 1872 he was elected a delegate to the National Republican Convention, and served as a Republican in the New York Legislature in 1874–75 and in the Forty-sixth and Forty-seventh Congresses (1879–81). He was elected to the United States Senate to fill the place of Thomas C. Platt, who resigned in 1881 as a result of the Conkling-Platt-Garfield fight concerning New York patronage, and served until 1887. As Senator, he was the author of bills granting increased pensions to disabled war veterans, of an eight-hour labor law for letter carriers, and of the "head money" immigration law. He incurred the bitter political enmity of Platt, as was evinced in the Republican National Convention when Harrison was nominated and when Miller was nominated, but defeated, for Governor of New York in 1888. After retiring, Miller gave his attention to his business, becoming an inventor of a wood-pulp process. He was also interested in an effort to construct an interoceanic canal by the Nicaragua route.

MILLER, Willet Green (?1869–). A

Canadian geologist. He was born in the township of North Walsingham, Norfolk Co., Ontario, and was educated at Toronto, Chicago, Harvard, and Heidelberg universities. He was assistant in field geology, Canadian Geological Survey (1891–93); was lecturer and later professor of geology and petrography in Queen's University (1893–1902); and in 1902 was appointed provincial geologist and inspector of mines for Ontario. From 1897 to 1901 he was in charge of the field work in eastern Ontario for the Bureau of Mines. He was elected a member of the Canadian Mining Institute, the American Institute of Mining Engineers, and the Geological Society of America. In 1906 he was a delegate to the International Geological Congress, Mexico City; in 1908–10 he was president of the Canadian Mining Institute; in 1911 he became a fellow of the Royal Society of Canada; and in 1915, for distinguished work, he was awarded the gold medal of the Institution of Mining and Metallurgy, London, England. A large number of his contributions on geological and mining subjects appear in the annual reports of the Ontario Bureau of Mines. He published *Minerals and how they Occur* (1906).

MILLER, William (1782–1849). An American religious leader, founder of the sect called Millerites or Second Adventists. He was born in Pittsfield, Mass., but when he was four years old his parents removed to Low Hampton, N. Y., which continued to be his home during most of the remainder of his life. He served as a captain in the American army during the War of 1812, but soon after its close became deeply interested in religion and devoted himself to the study of the Bible. As early as 1818 he came to the conclusion that Christ's second advent had been prophesied for the year 1843, and during the succeeding years became the author of a creed founded on this basis. In 1833 he was licensed to preach, though never ordained, by the Baptist church in Hampton and Whitehall, and in the same year issued a pamphlet entitled *Evidence from Scripture and History of the Second Coming of Christ about the Year 1843; and of His Personal Reign of One Thousand Years* (1833). Soon afterward he began to lecture on the same subject to large audiences in the New England and Middle States. As the year 1843 drew near his followers awaited the second coming with intense excitement. When the year ended he wrote to them confessing his error and acknowledging his disappointment. Later he set Oct. 22, 1844. Even after this second failure many of his disciples remained faithful to him and continued so till the day of his death. The name Adventist was agreed upon in 1845 as the proper designation of his creed. Consult Sylvester Bliss, *Memoirs of William Miller* (Boston, 1853), and James White, *Sketches of the Christian Life and Public Labors of William Miller* (Battle Creek, 1875).

MILLER, William (1795–1861). An English soldier, born at Wingham, Kent. Entering the British artillery, he served under Wellington in the Peninsular campaigns of 1811–14 and took part in the operations in Chesapeake Bay (1814). Returning to England, he traveled in Europe for two years and then went to Argentina. Later he joined the Patriot army in Chile and distinguished himself in many battles in the struggle for the independence of that country. In 1821 he went to Peru, where he rendered valuable service to the Patriot cause and rose to the rank of general of division. He became intimate with Bolívar, was made Governor of Potosí in 1825, and the following year returned to Europe, where he was received with many marks of distinction. In 1843 he was appointed British Consul General in the Pacific, in which post he served till his death. Consult John Miller, *Memoirs of General Miller in the Service of the Republic of Peru* (2d ed., 2 vols., London, 1829).

MILLER, William (1834–1912). A Canadian statesman, born at Antigonish, Nova Scotia, and educated at the academy there. Called to the bar in 1860, he became queen's counsel in 1872 and took rank as one of the leaders in his profession. He was elected a Liberal-Conservative member of the Nova Scotia Assembly in 1860 and was prominent in the debates on the Confederation of Canada. Although opposed to the financial part of the scheme, he rendered important service by carrying a resolution authorizing Nova Scotia delegates to frame a Confederation plan in London, England. Thus were secured, under Imperial auspices, changes which made the federal union acceptable to the Nova Scotia Legislature at a time when all appearances were adverse. Miller was called to the Senate in 1867, was Speaker thereof in 1883–87, and remained a member of that body until his death. He was chairman of the standing committees on private bills, railways and canals, and banking and commerce, and also of the joint committee of both Houses of Parliament on the codification of the criminal law. In 1891 he was sworn a member of the Queen's Privy Council for Canada.

MILLER, William Hallowes (1801–80). An English mineralogist. He was born at Velindre, near Llandovery, and was educated at St. John's College, Cambridge, where, after graduating in 1826, he became fellow and tutor. In 1832 he was appointed professor of mineralogy and in 1838 was elected a fellow of the Royal Society. In 1838 appeared his famous system of crystal notation in *A Treatise on Crystallography*, the most consistent and adaptable devised up to that time and still in common use. From 1843 to 1854 he was engaged as member of a government commission in replacing the standard of weights and measures, which had been destroyed by fire. In 1870 he served on the Commission Internationale du Mètre and from 1856 to 1873 was foreign secretary of the Royal Society. He contributed frequently to the scientific press and published *The Elements of Hydrostatics and Hydrodynamics* (3d ed., 1843).

MILLER, William Henry Harrison (1840–1917). An American lawyer and cabinet officer. He was born in Augusta, Oneida Co., N. Y., and graduated at Hamilton College in 1861. He removed in the same year to Ohio, taught school at Maumee for six months, and then enlisted as a private in the Eighty-fourth Ohio Volunteers and was promoted to a lieutenantcy. When his term of enlistment was completed he read law for some time at Toledo in the office of Judge Waite, and in 1863 settled in Peru, Ind., as superintendent of schools. There he was admitted to the bar in 1865. In 1866 he removed to Fort Wayne, where he practiced his profession until 1874, when, having established his reputation, he went to Indianapolis to become the law partner of Benjamin Harrison (q.v.). Their association lasted until the death of the latter, continuing throughout Harrison's administration as President, during which period (1889–93) Miller served as Attorney-General of

the United States, retiring to private practice in 1893. Perhaps his most prominent act while in the cabinet was in connection with the famous Terry case, in which he claimed that it was the constitutional duty of the executive to protect the judiciary.

MILLER, WILLIAM LASH (?1866–). A Canadian chemist. He was born at Toronto and was educated at Toronto and Munich universities. For several years he was a demonstrator of chemistry in Toronto University and in 1907 was appointed professor of physical chemistry. He was elected a member of the American Association for the Advancement of Science, vice chairman of the Canadian section, Society of Chemical Industry (1909), and a fellow of the Royal Society of Canada. He published many scientific papers.

MILLERAND, mēl'rän', ALEXANDRE (1859–). A French statesman and for long a Socialist leader, born in Paris, where he was educated at the Lycée Vanves and the Lycée Henri IV and, in law, at the university. He began to practice in Paris in 1881, was counsel to the striking miners of Montceau-les-Mines in 1882; was elected to the municipal council in 1884; and as a Radical Socialist, to the Chamber of Deputies in 1885. In 1889 he became proprietor of *La Voix,* which he made the organ of his personal views. In the Chamber of Deputies Millerand urged many reforms, especially relating to social legislation. He also gained prominence as editor in chief of the *Petite République* (until 1896) and as an impassioned orator. In 1899, as leader of the Parliamentary or Opportunist Socialists, he was made Minister of Commerce in the Waldeck-Rousseau cabinet against the wishes of the Marxian Socialists led by Guesde (q.v.). In this office he did much to pass laws in favor of the working classes. Some of the most important of these were the establishment of one day's rest a week, and a law making 10 hours the maximum day for women and children; he also made many attempts to procure the adoption of compulsory arbitration in industrial disputes. In 1902, just before the cabinet went out of office, a bill was passed making eight hours the maximum day for French miners. Millerand was expelled from the Socialist party because he had taken office in a non-Socialist cabinet. In 1909 he was Minister of Commerce and Postal and Telegraph Service. In the first Briand ministry (1909–10) he held the portfolio of Public Works and in 1912 entered Poincaré's cabinet as War Minister. He won great distinction in this office because of his energy in reorganizing the army and infusing it with enthusiasm. On Aug. 26, 1914, Millerand was again entrusted with the War portfolio under Viviani. On Sept. 23, 1920, he was elected President of France. See VOLUME XXIV.

MIL'LERITE (named in honor of W. H. Miller). A native nickel sulphide that crystallizes in the hexagonal system, has a metallic lustre, and is of a yellowish color. It occurs usually in capillary crystals in cavities with crystals of other minerals, especially in Bohemia, in Saxony, and in Cornwall, England; in the United States it is found at Antwerp, N. Y., in Lancaster Co., Pa., and especially in geodes in limestone near St. Louis, Mo., and Milwaukee, Wis. Millerite has been made artificially in groups of needle-like crystals.

MIL'LERSBURG. A village and the county seat of Holmes Co., Ohio, on Killbuck River, 86 miles south of Cleveland, on the Cleveland, Akron, and Columbus and the Baltimore and Ohio railroads (Map: Ohio, G 4). It has manufactures of foundry and machine-shop products, glassware, flour, brick, lumber, etc. Millersburg is surrounded by a rich agricultural region, carries on a considerable trade in draft horses, and has in its vicinity deposits of coal, iron ore, clay, and shale. The village owns and operates its water works. Pop., 1900, 1998; 1910, 2020.

MILLER'S TALE, THE. One of Chaucer's Canterbury Tales. It is the familiar story of an old husband deceived by a young wife. In this case the husband is a rich old simpleton, a carpenter of Oxford. The source is unknown, but is supposed to be one of the rude jesting stories of the time.

MILLER'S-THUMB (so called from the shape of the head), or RIVER BULLHEAD. A small, spiny-rayed fish (*Cottus gobio*) common in the streams of England and northern Europe and Asia. It rarely reaches 5 inches in length. It is brown above, varying in intensity, as in many fishes, with the color of the bottom, and white beneath. Its disproportionately large, flattened head compared to its body, and the entire absence of scales, give it an ugly appearance. The flesh is reddish when boiled, is said to be of excellent flavor, and is much sought after in some countries. In the United States a related species (*Cottus ictalops*) is sometimes called miller's-thumb. It occurs in all clear streams of the Northern and Middle States. These fishes live on small organisms and on fish eggs and are considered a destructive pest by fish culturists, especially in respect to trout eggs. The English fish is a favorite among anglers. Consult T. N. Gill, *Miller's-Thumb and its Habits, Smithsonian Institution, Miscellaneous Collections* (Washington, 1910).

MILLES, mil'lĕs, VILHELM KARL EMIL ANDERSSON (1875–). A Swedish sculptor, born near Upsala and educated in Stockholm and Paris. His father's name was Andersson, Milles being the name of a related family. His works include the Sten Sture monument (near Upsala), the polychrome statue of Gustavus Vasa, seated (Nordiska Museum, Stockholm), portrait busts of J. Kronberg (bronze, Göteborg Museum), O. Levertin (wood, National Museum), Mittag-Leffler (bronze), F. Boberg (bronze, National Museum), and G. Stridsberg (granite, National Museum); studies in animal life, as "Playing Elephants" (National Museum) and "Playing Bears" (granite, entrance to Berzelii Park, Stockholm). Later works are "Vingarna," boy with eagle (1910, bronze, National Museum), and the Scheele statue (1912, Köping). Milles is to be placed in the front rank of Swedish sculptors of his time.—His sister RUTH ANNA MARIA MILLES (1873–), also a sculptor, was born at Vallentuna and studied in Stockholm and (1898–1904) in Paris. She is best known for her statuettes, groups, and reliefs of types from Brittany and later Sweden, as: "Redcap and Wolf," "Fisherman's Wife," "Wild Flower," "Young Mother," "Bouquet-Lisa" (Thiels Gallery), "On the Way from Church," "Yvonne," "After Waiting" (National Museum), and "Wood from the Woods."

MIL'LET (Fr. *millet,* dim. of *mil,* OF. *mil, meil,* It. *miglio,* from Lat. *milium,* millet). A name applied to certain cereal and forage grasses of several distinct genera and species. Millets

are extensively used as forage crops in many countries and it has been estimated that they furnish food for about one-third of the inhabitants of the globe. They are widely cultivated for food in India, Japan, and other parts of Asia. In the United States the cultivated varieties of millet may be divided into three groups, viz., foxtail millets, barnyard millets, and broom-corn millets. The foxtail millets, perhaps the most important group, are of very ancient cultivation. They are believed by some writers to have been included in the order of Chinnong, 2700 B.C., requiring certain plants to be sown each year by the Emperor of China in a public ceremony. De Candolle considers this kind of millet a native of China, Japan, and the Indian Archipelago. The most common varieties of this group all belong to one species, *Setaria italica*, and are grown in North America, Europe, India, China, Japan, and north Africa. The barnyard millets include the cultivated varieties of the widely distributed species *Panicum Crus-galli*, or barnyard grass, and also the varieties belonging to other species of the genus *Panicum*, especially *Panicum colonum* and *Panicum frumentaceum*. The varieties derived from *Panicum Crus-galli* are considered the true barnyard millets, and among them a variety of Japanese barnyard millet and the Ankee grass of the southwestern United States are the most important. Shama or Sanwa millet, or jungle rice (*Panicum colonum*), a tropical plant, closely allied to true barnyard grass, is a valuable food and forage plant in many tropical and subtropical regions and extensively grown in southern and eastern Asia, but little in the United States. The third group, or broom-corn millets, comprises the varieties of *Panicum miliaceum*. This species, universally known to agriculture, has been in cultivation in Europe since prehistoric times and is still the common millet of the Old World. Its origin is very uncertain, but it is probably a native of the warmer regions of Asia. The classification of varieties of this species is based mainly upon the color of the ripe seed—yellow, white, and red. The term Indian or African millet is often loosely applied to certain of the nonsaccharine sorghums, such as durra, Kafir corn, and pearl millet (*Pennisetum typhoideum*), which last is also called Egyptian or cat-tail millet. Efforts have been made to develop the production of the class known as Kafir corn in certain sections of the United States having an insufficient rainfall to insure a reliable maize crop. The quantities produced have been satisfactory but the domestic market has thus far been extremely limited, considerable quantities having been exported to Europe where it is used as food for animals and domestic fowls. See ANDROPOGON; SORGHUM.

Millets are not well adapted to heavy clay or wet soils, but succeed best on fertile friable loams. The preparation of the soil is the same as for other grass crops. In the United States the seed is usually sown late in the spring to prevent the harvest of the millet from interfering with the harvest of the cereals. The seed is usually sown broadcast at the rate of one-half bushel to the acre. It is, however, often drilled. For hay, millet is usually harvested with a mower when the crop has just finished heading, and for the seed with a reaper like cereals a little before it is fully ripe. If harvested when fully ripe there is usually a heavy loss of seed in handling. Where the self-binder is used in harvesting this crop the sheaves are bound loosely and put up in shocks to cure. The yield of cured hay per acre ranges from four to six tons and the yield of seed from 40 to 50 bushels. According to the thirteenth census the United States produced, in 1909, 1,743,887 tons of millet hay and 588,270 bushels of seed, a decrease in the crop of about 25 per cent compared with 1899. This crop is practically free from attacks of insects and plant diseases.

Feeding Value. Millet is valuable principally as hay and as a soiling crop. It is also useful for silage. The ripened seeds are seldom fed to stock, but are much used as food for poultry and birds. If used as stock food they should be crushed or ground. The seed of broom-corn millet has found more favor in the United States as a cattle feed than that of other varieties. German millet cut when the heads are well filled but the seeds still soft has the following percentage composition: water, 71.7; protein, 2.7; fat, 0.5; nitrogen-free extract, 14.3; crude fibre, 9.3; and ash, 1.5. German millet hay: water, 7.7; protein, 7.5; fat, 2.1; nitrogen-free extract, 49; crude fibre, 27.7; and ash, 6. Other millets fresh and cured resemble in composition the examples quoted more or less closely. The average percentage composition of millet seed follows: water, 14; protein, 11.8; fat, 4; nitrogen-free extract, 57.4; crude fibre, 9.5; and ash, 3.3. In the case of barnyard millet hay 57.4 per hundredweight, of the protein 63.7 per hundredweight, of the nitrogen-free extract 51.6 per hundredweight, and of the crude fibre 61.6 per hundredweight were on the average found to be digestible. Millet hay is a useful coarse fodder for cows, but not more than six or eight pounds should be fed daily. When fed to lambs care should be exercised, as millet hay causes scours unless fed in small quantities. It has been observed that when horses were fed millet hay exclusively as coarse fodder, painful conditions called millet disease were induced. It is believed that the trouble may be avoided by using this hay in limited quantities, and not continuously. It is also possible that millet grown in some regions is harmless, while that grown in others is harmful. The plant has been used for farm animals since very early times, and generally speaking has proved a satisfactory feeding stuff. See Colored Plate of CEREALS.

Consult: T. A. Williams, *Millets* (Washington, 1899); C. R. Ball, *Pearl Millet* (ib., 1903); *United States Department of Agriculture, Year Book for 1898* and *Farmer's Bulletin 101*.

MILLET, mē'lā', AIMÉ (1819–91). A French sculptor and painter. He was born in Paris, received his first instruction in painting from his father, and studied sculpture with David d'Angers, and after 1852 gave up painting entirely. For his work in sculpture he won a gold medal at the exposition of 1889. His most ambitious work was the erection for Napoleon III in 1865 of a colossal copper statue of Vercingetorix at Alise-Sainte-Reine. His statues adorn several public buildings in Paris, among them an "Apollo" in bronze at the New Opéra. His mythological statues and groups include "Bacchante" (1885); "Narcissus" and "Ariadne," acquired by the state. Among his portrait statues are those of Denis Papin at Blois, Chateaubriand at St. Malo, Gay-Lussac at Limoges, and Edgar Guinet at Bourg. He executed many portrait busts and statues in marble and bronze. Although realistic in character, his art is theatri-

cal in pose. Consult Dumesnil, *Aimé Millet* (Paris, 1891).

MIL'LET, Francis Davis (1846–1912). An American mural and genre painter, war correspondent, illustrator, and author. He was born at Mattapoisett, Mass., Nov. 3, 1846, took part in the Civil War as a drummer and assistant surgeon, and graduated at Harvard (A.B., 1869; A.M., 1872). He was a pupil at the Royal Academy of Fine Arts at Antwerp (1871–72), and also studied in France and Italy, at the same time writing illustrated articles for American periodicals. During the Russo-Turkish War (1877–78) he was engaged by the New York *Herald*, the London *Daily News*, and the London *Graphic* as war correspondent, attached to General Skobelev's staff. His stories from the front were accompanied by sketches. He was director of the decorations and functions of the World's Fair at Chicago in 1893. The year 1898 saw him in the Philippines as the correspondent of the London *Times* and *Harper's Weekly*. Millet is now best known for the mural paintings to which he devoted the latter years of his life. The greatest of these is probably the "Evolution of Navigation" in the Custom House at Baltimore, Md.; but there are other important examples of his work in this field in the Post Office, Cleveland, Ohio; the Governor's room of the Minnesota State Capitol; the Hudson County Court House, Jersey City; the Essex County Court House, Newark, N. J.; the Supreme Court at Madison, Wis. The same strong synthetic sense, accuracy of detail, and harmonious grouping displayed in his decorative works also distinguishes his highly finished genre paintings of England in the eighteenth century and of classic Rome and Greece, in which costume and interior are studied with much detail, showing the influence of the Dutch school. His chief easel paintings include: "At the Inn," Union League Club, New York City; "A Cozy Corner" and "An Old-Time Melody," both in the Metropolitan Museum; "Between Two Fires," Tate Gallery, London; portraits of Mrs. Millet and President Butler of Columbia University (1906). He was prominently identified (1905–06) with the organization and endowment of the American Academy at Rome (q.v.), of which he was the first secretary. He was elected a member of the National Academy of Design (1885) and of the American Academy of Arts and Letters and an honorary member of the American Institute of Architects; was decorated with Russian and Rumanian military orders and medals for bravery; and received medals for paintings shown at Paris (1889), Chicago (1893), and Buffalo (1901). His literary works include: *Capillary Crime and Other Stories* (1892); *The Danube* (1892); *The Expedition to the Philippines* (1899). Millet lost his life in the sinking of the *Titanic*, April 15, 1912. For many years he had lived in Worcestershire, England. In 1913 a fountain was erected in Washington, D. C., in memory of Millet and of Archibald W. Butt (q.v.). Consult Beckwith, Baxter, Maynard, Blashfield, and Coffin, *Art and Progress*, vol. iii (Washington, 1912).

MILLET, mē'lā', Jean François (1814–75). A French genre and landscape painter of the Barbizon group, the greatest of all peasant painters. He was born at Gruchy, near Gréville (Manche), Oct. 4, 1814, the eldest son of a Norman peasant. His father, who exercised a great influence upon Millet's life and character, was a man of refined and deeply religious nature and of musical tastes, being cantor in the village church. Under the tuition of the village priest he received an elementary education, even mastering Greek, but his early years he spent on the farm, trying, during hours of rest, to draw the familiar scenery and life about him. His father took him to the neighboring town of Cherbourg, where he studied under Mouchel, a pupil of the school of David, and Langlois. In 1837, aided by a small gift of money from the council general of the department and by a small pension granted by the town council of Cherbourg, Millet went to Paris. He entered the studio of Delaroche, but, unable to endure his master's conventional methods, and constrained by poverty, he soon withdrew. With Marolle, a friend, he opened a little studio, giving his evenings to study and his days to painting cheap portraits and pastel imitations of Boucher and Watteau. He won some recognition with a portrait in the Salon of 1840, but soon returned to Normandy, where he married (1841). There he supported himself by painting signboards, and also produced "Sailors Mending a Sail" and other genre works. In 1842 he returned to Paris and in 1844 attracted the favorable attention of artists by his "Milkwoman" and "Riding Lesson." On the death of his wife he returned to Normandy, but remarried and came again to Paris in 1845. After a series of religious and classical subjects, none of which attained success, he at last found himself in the "Winnower" (1848, Louvre), his first important picture, bought by Ledru-Rollin, the Minister of State during the revolution of 1848, in which Millet took part.

In 1849 he abandoned Paris for the village of Barbizon, which he made his permanent home. Here the Norman peasant, as he called himself, was surrounded by scenes he loved, with incomparable models for the peasant pictures to which he henceforth devoted himself. "The Sower" (1850, Vanderbilt collection, Metropolitan Museum, New York) was followed by "Man Spreading Manure" (1852); "The Reapers" (1853); "A Peasant Grafting a Tree" (1855); "The Gleaners" (1857, Louvre), one of his very best works; "The Angelus" (1857, Louvre); "Death and the Woodcutter" (1859, Copenhagen Gallery); "Woman Feeding her Children" (La Becquée, 1860), in the Lille Museum; and others, all produced while he was hampered by illness and debts. In 1860 he bound himself by contract to give all his work for three years for 1000 francs a month, but the contract was dissolved in six months. To this period belong "The Sheep Shearing" (1860); "Woman Feeding Child," "The Sheep Shearer," "Waiting" (all in 1861); "Potato Planters" (1862); "The Wool Carder" (1863); and "The Man with the Hoe" (1863, San Francisco Museum). From 1860 his reputation was regarded as established, and after 1863 he no longer suffered want. In 1864 he exhibited "The Shepherdess" (Louvre) and "Peasants Bringing Home a Calf"; in 1865 he produced some decorative work. At the Paris Exposition of 1867 he received a medal of the first class and in 1868 the ribbon of the Legion of Honor. Driven from Barbizon by the Franco-Prussian War, Millet repaired to Cherbourg and did not return until late in 1871. He was deeply affected by the death, in 1867, of his friend Rousseau, with whom, of all others, he was most intimate. Although the state of his health,

which had been failing for some time, curtailed the hours of work, he continued to paint until December, 1874, when fever set in and he died on Jan. 20, 1875.

He was one of the artists selected by the government to decorate the Panthéon, but did not live to complete the commission. A number of important works are owned in the United States, among which are: "The Sower" and the "Water Carrier," "The Shepherdess," "At the Well," "The Knitting Lesson," "Hunting in Winter," the water color "Shepherd and Dog," and "Girl Raking Hay," all in the Metropolitan Museum, New York; "The Grafter," "Shepherdess," and "Water Carrier" (all three belonging to William Rockefeller); "The Turkey Keeper" (C. A. Dana, New York); "A Shepherdess Seated," "Homestead at Gréville," "Harvesters Resting," "Portrait of himself," and others in the Boston Art Museum; the "Planters" (Quincy Shaw collection, Boston); "Potato Harvest," "Sheepfold," "Breaking the Flax," and five other works in the Walters collection, Baltimore. Although Millet's paintings began to increase in value before his death, his family was left in straitened circumstances and was pensioned by the government. His principal pictures have been etched and engraved. Himself a peasant, living the peasant's life, he painted his class as has never been done before or since. Omitting the accidental, he rendered only the typical, and his great shadowy figures seem inevitably a part of the earth. It was the master's custom to paint from memory, using his admirable sketches but no models, and to this is partially due the simplicity and breadth with which he treated his subjects.

Equally famous with Millet's paintings are many of his drawings, such as his own portrait (1848); "Woman Feeding Chickens"; "Shepherd with Flock"; "The Newborn Lamb"; "Laundresses on the Shore"; "First Steps." His pastels, too, are much prized; good examples are the "Vine Dresser Resting" and "Woman Churning." All show a good draftsman, with a fine feeling for form. His color is sad in tone, gray and brown usually prevailing; and he achieved harmony by a masterly treatment of light and atmosphere. The landscape background and the animals of his paintings are the equals of those done by the greatest specialists in these branches. Among the best of his pure landscapes are "Church of Gréville," "Spring," and "Winter"; the first two are in the Louvre, which, since the acquisition of the famous Chauchard collection, contains in all 21 paintings by Millet. He was also an etcher of great power, as is evident from his 13 original plates of subjects of peasant life, as well as from a number of others after his paintings. His designs for woodcuts, generally engraved by his two brothers, show great originality, being executed in bold, coarse outlines, more like those of the old German masters than nineteenth-century etchings. Monuments to Millet have been erected in Cherbourg and Gruchy, and a bronze plaque attached to a rock at the entrance to the forest of Fontainebleau is dedicated to him and Rousseau.

Bibliography. Much the best biography of Millet was written by his friend Alfred Sensier, *La vie et l'œuvre de Jean François Millet* (Paris, 1881; abridged Eng. trans., Boston, 1896). Consult also: Alexandre Piedagnel, *Jean François Millet: souvenirs de Barbizon* (Paris, 1876); C. E. Yriarte, *Jean François Millet* (ib., 1885); J. C. Van Dyke, in *Modern French Masters* (New York, 1890); Thompson, *The Barbizon School* (London, 1890); E. M. Hurll (ed.), *J. F. Millet: A Collection of 15 Pictures, with Introduction and Interpretation* (Boston, 1900); Cartwright, *Millet: His Life and Letters* (New York, 1902); Walther Gensel, *Millet and Rousseau* (Bielefeld, 1902); Geffroy and Alexandre, *Corot and Millet* (New York, 1902); C. S. Smith, *Barbizon Days: Millet, Corot, Rousseau, and Barye* (ib., 1902); J. C. Ady, *Jean François Millet: His Life and Letters* (ib., 1902); H. Marcel, *J. F. Millet: biographie critique* (Paris, 1903); Romain Rolland, *Millet* (ib., 1903); Edgcumb Staley, *J. F. Millet*, in "Bell's Miniature Series" (London, 1903); Arthur Tomson, *Jean François Millet and the Barbizon School* (ib., 1905); Loys Deltiel, *Le peintre-graveur illustré, XIXe et XXe siècles* (Paris, 1906); L. Soullie, *Jean François Millet*, in "Les Grands Peintres aux Ventes Publiques" series (ib., 1909); P. M. Turner, *Millet* (New York, 1910); Richard Muther, *Jean François Millet* (London, 1910).

MILLET, Pierre (1635–1708). A Canadian pioneer missionary. He was born in Bourges, France, was educated for the Roman Catholic priesthood, and came to Canada in 1667. The following year he went to New York as a missionary to the Onondaga Indians. In 1672 he undertook a mission to the Oneidas in that colony, where he labored devotedly. He returned to Canada, met Governor Denonville at Cataraqui in 1686 and, in consequence of the Governor's expedition against the Iroquois, was suspected, though unjustly, of instigating it. At first the Oneidas, one of the Iroquois tribes, were hostile and sent a war party which captured him at Cataraqui in 1689 and took him back a prisoner to their country. They tortured him and threatened to kill him, but he was finally set free and adopted into their tribe, where he remained until 1694. In that year he returned to Quebec, where he died.

MILLET BEER. See Beer.

MILLI, mêl'lê, Giannina (1825–88). An Italian poetess. She was born at Terama and when but a child of five years is said to have composed verses. When 17 or 18 years of age she became a pupil of the poet Regaldi, the greatest of Italian improvisators, and soon developed considerable power in improvising popular religious and amatory verses. Medals were awarded her, and after her trips through the principal Italian cities (1857–60) a pension was bestowed upon her. She was appointed inspector of elementary schools for girls and superintendent of the normal school for young women in Rome. Her poems appeared in two volumes in 1862–63.

MIL'LIGAN, Ex Parte. The title of an important decision rendered by the Supreme Court of the United States in 1866, growing out of the events of the Civil War. The precise question raised was whether a citizen domiciled in a State where peace prevails, but which is adjacent to the theatre of war, may be deprived of the right of trial by jury and be subjected to trial before a military commission composed of army officers. The case grew out of the arrest of one Milligan, a citizen of Indiana, by a United States military officer in 1864 on charges of conspiracy, disloyal practices, inciting insurrection, and giving aid and comfort to the enemy. He was tried before a military commis-

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"THE GLEANERS," FROM THE PAINTING IN THE LOUVRE, PARIS

sion at Indianapolis, was found guilty, and was sentenced to be hanged. His counsel thereupon filed in the Circuit Court of the United States a petition for a writ of habeas corpus, denying the jurisdiction of the military commission on the ground that the civil courts in Indiana were open and unobstructed in the performance of their duties, that a United States grand jury which was then in session failed to find a bill of indictment, that the plaintiff was a civilian in no way connected with the military service, and that he was not a resident of a rebel State. The case was finally carried to the Supreme Court of the United States, where it was held that a military commission organized during the war in a State not invaded or in rebellion, and where the Federal courts were open and unobstructed, had no jurisdiction to try, convict, or sentence for a criminal offense a citizen who was neither a resident of a State in rebellion nor a prisoner of war nor a person in the military or naval service, and that Congress had no power to confer such authority on it. This opinion was rendered by a bare majority of the court, a vigorous dissenting opinion being delivered by Chief Justice Chase, in which three other justices concurred. The decision is given in *Wallace's Reports*, vol. iv. See MILITARY LAW; MARTIAL LAW.

MILLIGAN, GEORGE (c.1861–). A Scottish biblical scholar, son of William Milligan. He was educated at Aberdeen, Edinburgh, Göttingen, and Bonn; was minister of St. Matthew's, Morningside, and of Caputh; and in 1910 became regius professor of divinity and biblical criticism in Glasgow University. He published: *History of the English Bible* (1895); *The Lord's Prayer* (1895); *The Theology of the Epistle to the Hebrews* (1899); *The Twelve Apostles* (1904); *St. Paul's Epistles to the Thessalonians* (1908), Greek text, introduction, and notes, with special study of syntax and style; *Selections from the Greek Papyri* (1910); *The New Testament Documents: Their Origin and Early History* (1912), the Croall lectures for 1911–12; *The Vocabulary of the Greek Testament* (1914 et seq.), with J. H. Moulton.

MILLIGAN, ROBERT WILEY (1843–1909). An American naval officer. He was born in Philadelphia, entered the United States navy as third assistant engineer in 1863, and was regularly promoted to chief engineer in 1892, commander in 1899, and captain in 1902. During the Civil War he participated in both battles of Fort Fisher, and in the capture of Petersburg and Richmond, and during the Spanish-American War he was chief engineer of the *Oregon* on her famous run from the Pacific to the Atlantic coast and in the battle of Santiago. He served as chief engineer of the Norfolk Navy Yard from 1899 to 1905, when he was advanced to the rank of rear admiral and retired.

MILLIGAN, WILLIAM (1821–93). A minister of the Established church of Scotland, born in Edinburgh. In 1839 he graduated from St. Andrews University. He stood by the "Auld Kirk" at the disruption (1843), and was ordained minister to the Parish of Cameron, Fife, the following year. He studied in Germany from 1845 to 1846 and was placed at Kilconquhar from 1850 until 1860, when he was asked to occupy the newly created chair of biblical criticism in Aberdeen University. He assisted in the revision of the New Testament in 1870 and published works on the *Higher Education of Women* (1878); *The Resurrection of Our Lord* (1881; new ed., 1905); *Commentary on the Revelation* (1883); *Baird Lectures on the Revelation of St. John* (1886); *Elijah* (1887); *The Resurrection of the Dead* (1890); *Aims of the Scottish Church Society* (1892); besides a notable article for the *Encyclopædia Britannica* on the Epistle to the Ephesians (1879). He was sent to the United States Presbyterian General Assembly (1872) as a delegate from the corresponding body in Scotland.

MILLIKIN UNIVERSITY. See JAMES MILLIKIN UNIVERSITY.

MILLIN, mē'lăn', AUBIN LOUIS (1759–1818). A French archæologist, born in Paris. His first literary attempts were translations from the German and English, which were published in the *Mélanges de littérature étrangère* (1785–86). His protest against the excesses of the Revolution made it necessary for him to flee from Paris, and he was imprisoned for a year in St. Lazare on his return. In 1795 he was placed in charge of the cabinet of antiques and medals in the National Library, was instrumental in the creation of a chair of antiquities, and the same year undertook the direction of the *Magazin Encyclopédique*. Much of his voluminous writing on his special subject appeared in this periodical, which, in 1817, became the *Annales Encyclopédiques*, and he published also *Antiquités nationales* (1790–98); *Introduction à l'étude des médailles* (1796); *Monuments antiques inédits* (1802–04); *Dictionnaire des beaux-arts* (1806); *Histoire métallique de la révolution française* (1806). His travels in Italy and the south of France in search of antiques provided material for *Voyage dans les départements du midi de la France* (1807–11); *Peintures de vases antiques* (1808–10; new ed., 1891); *Voyage en Savoie, au Piémont, dans le Milanais* (1816–17).

MILLING MACHINE. See METAL-WORKING MACHINERY.

MILLINOCK'ET. A village in Penobscot Co., Me., 83 miles by rail north of Bangor, on the Bangor and Aroostook Railroad (Map: Maine, D 3). The manufacture of paper constitutes the chief industry. Some timber is found in the surrounding region. Pop., 1910, 3368.

MIL'LIPEDE. A myriapod of the order Chilognatha (or Diplopoda) having a dorsally convex body composed of many segments, all of which, except the first four, bear each two pairs of legs, and lacking maxillipes. See CENTIPEDE; MYRIAPODA.

MIL'LIS, JOHN (1858–). An American officer of engineers, born at Wheatland, Mich. He graduated, with first rank, from the United States Military Academy in 1881, and served at Willets Point, N. Y. (1881–83), and on lighthouse duty, especially in experiments with electric lighting (1883–90). Millis was charged with the preparation of the lighting of the Bartholdi Statue in New York harbor. From 1890 to 1894 he managed Federal improvements in the Mississippi levees and New Orleans harbor; then for four years was chief engineer of the Lighthouse Board; and in 1900 was delegate to electrical, physical, and navigation congresses in Paris during the Exposition, and was sent to Egypt to report on the Assuan Dam. After his return to America he was ordered to Seattle to construct fortifications in Puget Sound and government improvements in Washington, Idaho, and Montana. In 1905–07 he had charge of all

fortification construction in the Philippine Islands, conducted the river and harbor improvements in Indiana and Ohio and on Lake Erie in 1908–12, and was then detailed for special duty under the Bureau of Lighthouses. He was promoted to colonel of engineers in 1910.

MILLÖCKER, mĭl'lē-kĕr, Karl (1842–99). An Austrian composer of light opera. He was born in Vienna and received his musical education in the conservatory of that city. In 1864 he was appointed kapellmeister at the Graz Theatre and from 1869 to 1883 occupied a similar position at the Theater an der Wien in Vienna. His music is marked by its spontaneous melodiousness and sprightly instrumentation. The principal published works include: *Der todte Gast* and *Die beiden Binder* (1865); *Diana* (1867); *Die Fraueninsel* (1878); *Der Regimentstambour* (1869); *Drei Paar Schuhe* (1870); *Die Musik des Teufels* (1870); *Das verwunschene Schloss* (1878); *Apajune, der Wassermann* (1880); *Die Jungfrau von Belleville* (1881); *Der Bettelstudent* (1881); *Gasparone* (1884); *Der Viceadmiral* (1886); *Die sieben Schwaben* (1887); *Der arme Jonathan* (1890); *Das Sonntagskind* (1892); *Der Probekuss* (1895); *Das Nordlicht* (1897).

MIL'LOM. A town in Cumberland, England, 9 miles northwest of Barrow. It is situated on the west coast of Duddon estuary and has a shallow tidal harbor. It numbers among its antiquities an early Norman church and the eleventh-century Millom Castle. The most productive mines of red hematite ore in England are worked in the vicinity, and it has numerous blast furnaces. The town owns its markets, water and gas works, and maintains a library, technical schools, recreation grounds, and isolation hospital. Pop., 1901, 10,426; 1911, 8612.

MILLO MAIZE. See Andropogon; Sorghum.

MILL ON THE FLOSS, The. A novel by George Eliot (q.v.), published in 1860.

MILLS, Albert Leopold (1854–1916). An American soldier, born in New York City. He graduated at the United States Military Academy in 1879, was appointed second lieutenant of the First Cavalry, was stationed at Fort Walla Walla, Washington Territory (1879–82), and engaged in frontier duty elsewhere. He saw active service against the Crows in 1887 and against the Sioux in 1890. He became first lieutenant in 1889. He was professor of military science and tactics at the State Academy, Charleston, S. C., for a year (1886–87), held an appointment at the United States Infantry and Cavalry School, Fort Leavenworth, Kans., from 1894 until 1898, and in the Spanish-American War participated in the Santiago campaign as captain and assistant adjutant general of volunteers. He was voted a medal by Congress in 1898, for his services near Santiago. In August, 1898, he was made superintendent of the United States Military Academy, West Point, with the rank and pay of colonel, and in October of the same year was promoted to the regimental rank of captain. In 1904 he was made brigadier general and in 1906 was detached from the command of the Military Academy, the scope and general efficiency of which had broadened considerably under his administration, and was assigned to duty in the Philippine Islands. In 1909 he returned to the United States to take command of the Department of the Gulf, and in 1912 was for part of a year president of the Army War College. After September of 1912 he served as chief of the division of militia affairs on the general staff.

MILLS, Charles Karsner (1845–). An American neurologist, born in Philadelphia and educated at the Central High School and the medical department of the University of Pennsylvania. He began to practice in 1869; was professor of diseases of the mind and nervous system at the Philadelphia Polyclinic (1883–98) and clinical professor of nervous diseases at the Women's Medical College of Pennsylvania. At the University of Pennsylvania he served as professor of mental diseases and medical jurisprudence (1893–1901), clinical professor of nervous diseases (1901–03), and professor of neurology after 1903. He attained a high reputation as an alienist. Besides monographs on mental and nervous strain, he published: *Practical Lessons in Nursing* (new ed., 1904); *Physiology and Hygiene* (rev. ed., 1904); *The Nursing and Care of the Nervous and Insane* (new ed., 1912); and edited a valuable *Treatise on the Nervous System and its Diseases* (1898).

MILLS, Clark (1815–83). An American sculptor, born in Onondaga Co., N. Y. In his youth he followed the trade of a plasterer, at the same time modeling ideal heads in clay. Although entirely self-taught and without knowledge of professional methods, in 1846 he completed a marble bust of John C. Calhoun, which was purchased by the city of Charleston for the city hall. In 1848 he furnished a design for an equestrian statue of General Jackson, to be placed in Lafayette Square, Washington. There being no bronze foundry for such work in the United States, Mills erected in Washington an experimental foundry, where in 1852 he succeeded in producing a perfect cast. It was formally accepted Jan. 8, 1853, and, although without artistic value, is interesting as the first equestrian statue in American sculpture. He was next engaged on the colossal equestrian statue of Washington, which was formally unveiled in the national capital Feb. 22, 1860. Mills's last work was the casting (1863) of Crawford's colossal statue of Liberty, which crowns the dome of the Capitol at Washington. Compared with present-day sculpture the work of Mills seems inferior and mechanical, but it marks a stepping-stone in the advance of American art.

MILLS, Darius Ogden (1825–1910). An American financier and philanthropist, born at North Salem, N. Y. He was a clerk in New York City and served as a bank cashier at Buffalo, N. Y., in 1847–49. In 1849 he went to California, where he became a merchant and dealer in exchange at Sacramento and founded the bank of D. O. Mills & Co. In 1864–67 he was president of the Bank of California, San Francisco; and after the failure of that institution under his successor Mills reëstablished it on a sound basis. In 1880 he moved to New York City, where he erected the Mills Building on Broad Street and where he became identified with a variety of interests, as trustee of the Metropolitan Museum of Art, the American Museum of Natural History, and the American Geographical Society, and as president of the New York Botanical Gardens. In 1868–80 he was regent and treasurer of the University of California, in which he endowed a chair of philosophy; and he was also trustee of the Lick estate and Observatory. Mills gave extensively to philanthropic objects. The three Mills hotels

in New York, where poor but self-respecting men may obtain meals and lodgings at a nominal price, stand as a monument to his wise benevolence. They proved especially successful and attracted wide attention among charity workers and social investigators. At the time of his death Mills possessed a fortune of $35,000,000. His daughter married Whitelaw Reid (q.v.).

MILLS, David (1831–1903). A Canadian statesman and jurist. He was born in the township of Orford, Kent Co., Ontario, was educated at the local schools, and graduated in law at the University of Michigan in 1855. After teaching for a time he was school superintendent for Kent County until 1865. Entering political life at Confederation in 1867, he was elected Liberal member for Bothwell in the first Dominion Parliament and, with the exception of one legislative session (1882), retained his seat in the House of Commons until 1896. He edited the London (Ontario) *Daily Advertiser* in 1882–87, was called to the Ontario bar in 1883, and was soon afterward employed by the Ontario government in several important cases. He became an authority on constitutional and international law and in 1888–1900 was professor of these subjects in Toronto University. He was Minister of the Interior (1876–78) in the administration of Alexander Mackenzie (q.v.), was called to the Senate in 1897, and was Minister of Justice (1897–1901) in the administration of Sir Wilfrid Laurier (q.v.). In 1901 he was appointed a judge of the Supreme Court of Canada, which position he retained until his death. As a private member of Parliament (1879–96) Mills advocated measures for better securing the independence of the electorate, and in 1895 made a motion in the House of Commons to reform the Senate. He published: *Report on the Boundaries of Ontario* (1873); *The Canadian View of the Alaskan Boundary Dispute* (1899); *The English in Africa* (1900); and many magazine articles on political and economic subjects.

MILLS, Hiram Francis (1836–). An American hydraulic and sanitary engineer, born at Bangor, Me. After graduating C. E. from the Rensselaer Polytechnic Institute in 1856 he was engaged in engineering work on the Bergen (N. J.) tunnel of the Erie Railroad (1858), on the Brooklyn water works (1859), at Cohoes, N. Y. (1859), and, under the noted hydraulic engineer, James B. Francis, at Lowell, Mass. (1860–63). For the next six years he was employed on important railroad, dam, and water-power works, including the Hoosac Tunnel on the Fitchburg Railroad, Massachusetts. In 1869 he began a long career in the control of water power on the Merrimac River, first at Lawrence and later at Lowell as well. He served as chief engineer of the Essex Company at Lawrence after 1869, and as consulting engineer of the Proprietors' Locks and Canals at Lowell in 1893, becoming chief engineer in 1894. In 1901 he was appointed consulting engineer of the Boston Metropolitan Water and Sewerage Board. From 1886 to its dissolution in 1914 he was engineer member of the Massachusetts State Board of Health, chairman of its committee on water supply and sewerage, and directed the Lawrence Experiment Station investigations of water and sewage purification, known throughout the sanitary world. In 1892–93 he designed and built the slow sand filters of the water works of Lawrence, Mass.; these marked a new era in water purification. After 1868 he served as consulting engineer on various other works in the United States and Mexico.

MILLS, James (1840–). A Canadian educator and railway administrator. He was born near Bond Head, Ontario, and was educated at Victoria University, where he graduated at the head of his class in 1868. He taught successively at Stanstead (1868–69), Cobourg (1869–72), and Brantford (1873–79), gaining high rank in his profession. He was appointed president of the Ontario Agricultural College at Guelph in 1879, in which position he remained for 25 years, bringing the college to a high state of efficiency. As its president and the organizer for 10 years of farmers' institutes he did eminent service for agricultural education in Ontario. He was a member of the San José Scale Commission (1899). In 1904 he was appointed a member of the Board of Railway Commissioners for Canada. He was a member of the board of regents, Victoria University (1890–1910), and was also appointed a senator of Toronto University. With Thomas Shaw he wrote *First Principles of Agriculture* (1890).

MILLS, Lawrence Heyworth (1837–1918). An English Orientalist. He was born in New York City and graduated at the University of the City of New York (now New York University) in 1857. He then studied for orders at the Fairfax County Episcopal Seminary near Alexandria, Va., and was ordained in 1861, after which he held a charge in Brooklyn until 1867. Retiring from the ministry, he went to Europe in 1872, where he devoted himself first to a study of Gnosticism and then to the Avesta, which was to prove his life work. In 1887, at the request of Max Müller, he went to Oxford, where in 1898 he was made professor of Zend philology. Mills's researches were concerned mainly with the older portion of the Avesta texts, the Gâthâs (q.v.), which he studied exhaustively, adhering in the main to the system of the traditional school of interpretation. He also published many contributions on the early phases of Zoroastrianism, and must be regarded as one of the foremost of Iranian scholars. Among his works are: "Zend Avesta, part iii," in Müller, *Sacred Books of the East*, vol. xxxi (Oxford, 1887); *Study of the Five Zarathushtrian (Zoroastrian) Gâthâs* (1894); *Gâthâs of Zarathushtra (Zoroaster) in Metre and Rhythm* (1900); *Dictionary of the Gâthic Language of the Zend-Avesta* (1902–14); *Zoroaster, Philo, the Achæmenids, and Israel* (2 vols., 1904–06); *Avesta Eschatology Compared with the Books of Daniel and Revelations* (1908); *Yasna I*, with Avesta, Sanskrit, Pahlavi, and Persian texts (1910); *Our own Religion in Ancient Persia*, lectures delivered at Oxford (1913); *Lore of Avesta in Catechetical Dialogues* (1914).

MILLS, Robert (1781–1855). An American engineer and architect. He was born in Charleston, S. C., and studied under Benjamin H. Latrobe. He erected several customhouses and marine hospitals, and in 1820 was appointed State architect and engineer of South Carolina. In 1836 President Jackson made him the official architect of the United States government and supervising architect of the Capitol; this office he held until 1851. Under this and the next administration Mills designed and had charge of the erection of the Treasury Building, the General Post Office, the Patent Office Building, and the National Washington Monument.

MILLS, Roger Quarles (1832–1911). An American soldier and statesman, born in Todd Co., Ky. He removed to Palestine, Tex., in 1849, studied law while acting as clerk in the post office, and at 20 was admitted to the bar. He was elected to the Texas House of Representatives in 1859, but entered the military service of the Confederacy at the outbreak of the Civil War and took part in the battles of Arkansas Post (Jan. 11, 1863), Chickamauga (Sept. 19–20, 1863), where he commanded a brigade, New Hope Church (May 27, 1864), and Atlanta (July 22, 1864). In 1873 he was elected to Congress, where he continued as a member of the House until 1892, when he was chosen to fill an unexpired term in the Senate, and the next year was reëlected for the full term. As a Representative, he bitterly opposed the Electoral Commission resolution, claiming that Tilden was constitutionally elected. In 1884–88 he was chairman of the House Committee on Ways and Means, in which capacity he drafted in 1888 the Cleveland administration tariff act, the so-called Mills Bill, which made important reductions in existing rates and was famous as a party measure. Since the Republicans controlled the Senate, it failed of enactment, as was expected.

MILLS, Samuel John (1783–1818). An American missionary. He was born at Torringford, Conn., April 21, 1783, and graduated at Williams College in 1809. While in college he first suggested to a group of students the project of foreign missions, at a meeting for prayer by a haystack near the college. After spending a short time in the study of theology at New Haven he entered Andover Theological Seminary in 1810. With Judson, Hall, Newell, and Nott he united in a memorial to the General Association of Massachusetts (Congregational), which resulted in the formation of the American Board of Commissioners for Foreign Missions. He was licensed to preach in 1812 and spent two years in mission work in the Southern and Western States. He suggested the formation of a national Bible society, which resulted in the organization of the American Bible Society. To him was due the formation of the United Foreign Mission Society. Through his exertions in conjunction with Dr. Finley the American Colonization Society was formed in 1817 and he was appointed with Dr. Burgess to visit England in behalf of the society and to explore the west coast of Africa for a suitable site for a colony of colored people from America. He sailed in November, 1817, and arrived on the coast March 12. He embarked for the United States, May 22, 1818, and died at sea June 16. He is called the "father of foreign missions in America." Consult the memoir by Spring (New York, 1854), and T. C. Richards, *Samuel J. Mills* (Boston, 1906).

MILLS, Sebastian Bach (1838–98). An Anglo-American piano virtuoso and teacher, born at Cirencester in England. He was trained by his father and under Potter and Sterndale Bennett and was regarded as the most precocious child musician in Great Britain. He completed his musical education under Moscheles, Plaidy, and the other distinguished teachers of the Leipzig Conservatory. After leaving Leipzig he studied for a period under Liszt, who held him in high estimation. He returned for a little while to England, where he held the appointment of organist at the Roman Catholic cathedral at Sheffield (1855). Three years later he returned to Germany and played at a Gewandhaus concert (Dec. 2, 1858). The following year he appeared in New York under the auspices of the Philharmonic Society and thereafter made his home in America. He was very successful as a teacher and as a concert pianist was as popular in Germany as in the United States. His compositions are few and comparatively unimportant. He died at Wiesbaden.

MILLS, Thomas Wesley (1847–1915). A Canadian physiologist and educator. He was born at Brockville, Ontario, and was educated at Toronto University, and in medicine at McGill University, afterward studying in England and Germany. At McGill University he was successively demonstrator of (1882–84), lecturer in (1884–86), and professor of (1886–1910), physiology. In 1910 he was made professor emeritus of physiology in the same university. He was one of the founders of the Society for the Study of Comparative Physiology (1885). Among his publications are: *A Text-Book of Animal Physiology, etc.* (1889); *A Text-Book of Comparative Physiology* (1890); *How to Keep a Dog in the City* (1891); *The Dog in Health and Disease* (1892); *The Nature and Development of Animal Intelligence* (1898); *Voice Production in Singing and Speaking on Scientific Principles* (1906).

MILLS COLLEGE. A college for women, with a campus of 150 acres, in the suburbs of Oakland, Cal. It was founded as a seminary in 1865 and chartered as a college in 1885. In May, 1911, the seminary department was discontinued. Its entrance requirements are those of any standard college, and the degrees granted are A.B., B.L., and B.S. In addition to the regular departments of liberal culture it offers special opportunity for work in home economics, physical education, music, and fine arts. In 1914–15 the students numbered 137 and the faculty 32. The endowment of the college is $500,000 and the value of the property $500,000. The president in 1915 was Luella C. Carson, LL.D.

MILL SPRINGS, Battle of. A battle fought at Mill Springs, Ky., about 10 miles west of Somerset, on Jan. 18, 1862, between a Federal force of about 4000 men under Gen. George H. Thomas and an approximately equal Confederate force under Gen. George B. Crittenden. The Confederates attacked with great energy, but were finally driven in some confusion from the field. The engagement is also sometimes called the battle of Fishing Creek and the battle of Logan's Crossroads. On the battleground a national cemetery was subsequently established, where 718 soldiers lie buried, 352 known and 366 unknown.

MILL'STONE. A wheel or circular mass of rock used in grinding wheat and other grains. For good millstones the rock must be tough, hard, and possess a cellular structure so as to maintain a rough grinding surface. Several varieties of rocks have been found to possess these qualities in a greater or less degree and have been extensively employed for millstones. In the United States the rock most commonly used is a coarse granular sandstone, which is obtained in Ulster Co., N. Y., in Lancaster Co., Pa., and in Montgomery Co., Va. The celebrated French buhrstones consist of a cellular chert occurring in the Tertiary of the Paris basin. The German millstones are largely quar-

ried from a sheet of basaltic lava found near Cologne. The foreign stone is imported into the United States in small pieces and is then built up into wheels, while the domestic stone is quarried and dressed to form a solid wheel. The introduction of the roller process for the manufacture of flour has curtailed the use of millstones to a great extent. In 1913 the production of millstones in the United States was valued at $56,163. See ABRASIVES.

MILLSTONE GRIT. A hard siliceous conglomerate with quartz pebbles. Its geological position is at the base of the Pennsylvanian (Coal Measures) series of the Carboniferous system. The beds along the Appalachian Range in Pennsylvania are very coarse and are over 1200 feet thick. The rock here is a light-colored siliceous conglomerate known as the Pottsville Conglomerate, interstratified with some sandstone and thin beds of carbonaceous shells. The formation is represented also in New York and as far south as Alabama. Thin beds of coal are found in it in Pennsylvania, and in the southern Appalachians the coal beds are very important. See CARBONIFEROUS SYSTEM.

MILL'VALE. A borough in Allegheny Co., Pa., on the Allegheny River, opposite Pittsburgh, with which it is connected by bridge, and on the Pennsylvania and the Baltimore and Ohio railroads (Map: Pittsburgh, F 2). It has iron manufactures, saw works, stone works, lumber mills, breweries, etc. The government is vested in a burgess, elected every three years, and a borough council. The water works and electric-light plant are owned by the municipality. Pop., 1900, 6736; 1910, 7861.

MILL VALLEY. A town in Marin Co., Cal., 12 miles north of San Francisco, on the Northwestern Pacific and the Muir Woods and Mt. Tamalpais Scenic railroads (Map: California, C 5). It is situated in a region of remarkable scenic beauty and adapted to fruit growing. Mill Valley owns its water works. Pop., 1910, 2551.

MILLVILLE. A city in Cumberland Co., N. J., 40 miles south of Philadelphia, on the Maurice River, at the head of deep-water navigation, and on the Pennsylvania Railroad (Map: New Jersey, B 5). It has city and high-school libraries, a fine high-school building, a hospital, and a large public park at Union Lake, a beautiful sheet of water 3 miles long and 1½ in width. Millville is essentially a manufacturing centre, having extensive glass factories, iron foundries, cotton mills, wrapper and shirt-waist factories, and bleach and dye works. The city has adopted the commission form of government. Millville was incorporated as a town in 1801 and was chartered as a city in 1866. Pop., 1900, 10,583; 1910, 12,451; 1914 (U. S. est.), 13,246; 1920, 14,691.

MIL'MAN, HENRY HART (1791–1868). An English poet and ecclesiastical historian. He was the youngest son of Sir Francis Milman, physician to George III, and was born in London, Feb. 10, 1791. He was educated at Eton and afterward at Brasenose College, Oxford, where he obtained the Newdigate prize with an English poem on the Apollo Belvedere in 1812 and graduated B.A. in 1814. He published *Fazio, a Tragedy,* which was successfully brought upon the stage at Covent Garden in 1815; took orders in 1817, and in 1818 was appointed vicar of St. Mary's, Reading. In 1818 appeared his *Samor, Lord of the Bright City, an Heroic Poem,* which was followed in 1829 by the *Fall of Jerusalem,* a dramatic poem with some fine sacred lyrics interspersed. In 1821 Milman was chosen professor of poetry at Oxford and held the position for 10 years. He published three other dramatic poems, *The Martyr of Antioch* and *Belshazzar,* both in 1882, and *Anne Boleyn* in 1826. His Bampton lectures on *The Character and Conduct of the Apostles Considered as an Evidence of Christianity* appeared in 1827 and his *History of the Jews* (3 vols.) in 1830. The last of these works did not bear the author's name. Its weak point was a want of adequate learning, especially in the department of biblical criticism, but its fresh, natural treatment of biblical history was a novelty and was severely attacked as heresy. A new edition, greatly improved and more critical, was published in 1863, and another, with further improvements, in 1867. He became a canon of Westminster and rector of St. Margaret's, Westminster, London, in 1835, and the same year he published certain translations of Sanskrit epic poetry. In 1840 appeared a collected edition of his *Poetical Works,* containing some other pieces besides those already mentioned. The same year witnessed the publication of his *History of Christianity from the Birth of Christ to the Abolition of Paganism in the Roman Empire* (3 vols.). In 1849 he was made dean of St. Paul's and discharged the duties of the office in such a manner as to win the title of "the Great Dean." In 1854–56 he published his masterpiece, *History of Latin Christianity, Including that of the Popes to the Pontificate of Nicholas V* (6 vols.), a work whose candid, sympathetic scholarship made an era in the study of ecclesiastical history in England. Milman edited Gibbon (1838) and an edition of Horace (1849), and published translations of the *Agamemnon* and *Bacchæ* (1865). He contributed extensively to the *Quarterly Review.* He died in Sunninghill, near Ascot, Sept. 24, 1868. A posthumous work contains his *Annals of St. Paul's Cathedral* (1868) and another *Essays on St. Paul, Savonarola, Erasmus, etc.* (1870). His historical works were republished in 15 volumes (1866–67). Consult his biography by A. Milman (London, 1900).

MIL'MORE, MARTIN (1844–83). An American sculptor. He was born at Sligo, Ireland, and in 1851 was taken to Boston. His first instruction was in wood carving, but in 1860 he began his studies in sculpture with Thomas Ball in Boston. His first work to receive notice was his ideal alto-relievo "Phosphor" (1863). In the same year he executed the statuette "Devotion" and later an ideal child statue and cabinet busts of Longfellow and Charles Sumner. In 1864 he was commissioned to execute statues of Ceres, Flora, and Pomona for Boston Horticultural Hall (Tremont Street). One of his most effective pieces is his soldiers' monument for Forest Hills Cemetery, Roxbury (1867), which ranks high among American works of art for conception and execution. The Soldiers' and Sailors' Monument on Boston Common, unveiled in 1874, is his greatest and most elaborate work and gives proof of an unusual sense of the monumental. While preparing designs for this work he resided at Rome, where he made busts of Pope Pius IX, Wendell Phillips, and Ralph Waldo Emerson. He died in Roxbury, Mass. Among other works are his life-size bust of Charles Sumner, Metropolitan Museum, New

York City; a statue of General Thayer, West Point, N. Y.; busts of General Grant, Lincoln, Daniel Webster, and others; war monuments at Keene, N. H., Erie, Pa., and Charlestown and Fitchburg, Mass. With his brother he executed the great granite Sphinx in Mount Auburn Cemetery, Cambridge, Mass. It was in commemoration of Milmore that Daniel Chester French modeled his celebrated bronze relief "Death and the Young Sculptor."

MILNE, mĭln, JOHN (1850–1913). An English mining engineer and seismologist, born in Liverpool. He was educated at King's College and the Royal School of Mines in London and subsequently went to Newfoundland and Labrador, where he worked as a mining engineer. Later he was the geologist of Dr. Beke's expedition into northwestern Arabia, and was then for 20 years in the service of the Japanese government. During that period he established the seismic survey of Japan, which comprises more than 900 stations and which may be said to have inaugurated the systematic study of earthquake phenomena. In the course of his investigations he traveled over a great part of the world, visiting the United States, Russia, Siberia, Mongolia, Korea, China, the Kuriles, the Philippines, Borneo, and Australasia, and finally devoted himself to the establishment of a seismic survey of the world. He invented seismographs and instruments to record vibrations on railways, and published important works on seismology and geology, including *Earthquakes and Other Earth Movements* (1883; 6th ed., 1913); *Seismology* (1888); *The Miner's Handbook* (1894; 3d ed., 1902); *Crystallography.*

MILNE-EDWARDS, mĭln-ĕd′wardz, *Fr. pron.* mēl′nȧ′dwär′, ALPHONSE (1835–1900). A French zoölogist, son of Henri Milne-Edwards, born in Paris. Though he took the degree of M.D. in 1860 he devoted his life to the study of zoölogy and, after holding various minor positions, was appointed professor of zoölogy in the Museum of Natural History, Paris, in 1876, becoming director in 1892. His earlier publications were in physiological medicine, but the greater part of his work was done in zoölogy, paleontology, and deep-sea exploration. His work on fossil Crustacea appeared in 1865; an extensive and valuable treatise on the fossil birds of France was published in 1866–72. He also described the extinct birds of the Mascarene Islands and of Madagascar. He worked long and patiently on the Crustacea, preparing elaborate reports on the deep-sea forms. His publications include: *Histoire des crustacés podophthalmaires fossiles* (1865); *Recherches anatomiques et paléontologiques pour servir à l'histoire des oiseaux fossiles de la France* (2 vols., 1867–72); *Expéditions scientifiques du travailleur et du talisman* (1888).

MILNE-EDWARDS, HENRI (1800–85). A French naturalist, born at Bruges. His father was an Englishman. He studied medicine, but after taking his degree in 1823 turned to the study of zoölogy and began his scientific career by publishing, in 1828, his *Recherches anatomiques sur les crustacés.* In 1841 he was appointed professor of entomology at the Museum of Natural History, Paris. In 1862 he succeeded Geoffrey St. Hilaire in the chair of zoölogy and in 1864 became director. From 1837 on he edited the zoölogical portion of the *Annales des sciences naturelles* and contributed extensively to this journal. He was the first to describe the important biological principle of the physiological division of labor. His most important works besides the *Recherches* above mentioned were: *Eléments de zoölogie ou leçons sur l'anatomie, la physiologie, la classification, etc., des animaux* (1834–35; republished as a new edition with the title *Cours élémentaire de zoölogie,* 1851); a completion and revision of Lamarck's *L'Histoire naturelle des animaux sans vertèbres* (1836–45), with Deshayes; *Leçons sur la physiologie et l'anatomie comparées de l'homme et des animaux* (1855–84).

MIL′NER, ALFRED, first VISCOUNT (1854–). An English colonial Governor, born at Bonn, Germany, March 23, 1854. He studied at Tübingen, at King's College, London, and at Balliol College, Oxford, studied law, and from 1882 to 1885 devoted himself to journalism, serving under John Morley and W. T. Stead. His service as private secretary to G. J. (afterward Lord) Goschen, Chancellor of the Exchequer (1887–89), began his public career. He proved an able Undersecretary for Finance in Egypt (1889–92), publishing his observations as *England in Egypt* (1892; 12th ed., 1915), and was chairman of the Board of Inland Revenue in 1892–97. In 1897 Milner was appointed High Commissioner for South Africa and Governor of the Cape of Good Hope. He held the former post through the difficult period preceding and succeeding the South African War; was created Viscount in 1902, and in 1901 was appointed Governor of the Transvaal and Orange River Colonies. He resigned as High Commissioner and Governor in March, 1905, and returned to England. Regarded by many as coauthor with Cecil Rhodes and Mr. Chamberlain of the South African War, he was subjected to much criticism in Liberal circles, especially after the fall of the Unionist ministry in December, 1905. In March, 1906, the House of Commons expressed in an indirect way its disapproval of his action in permitting the flogging of a Chinese coolie in the Transvaal. In reply the House of Lords, by an overwhelming vote, placed on record its high appreciation of Lord Milner's services, and in August he was presented with an address of the same nature signed by more than 370,000 names. He published *The Nation and the Empire* (1913). Consult: E. B. Iwan-Müller, *Lord Milner and South Africa* (London, 1902); W. B. Worsfold, *Lord Milner's Work in South Africa* (ib., 1906); id., *The Reconstruction of the New Colonies under Lord Milner* (2 vols., ib., 1913).

MILNER, JOHN (1752–1826). An English Roman Catholic scholar, born in London. He was ordained priest in 1777; settled at Winchester in 1779; became titular Bishop of Castabala in 1803, and was made Apostolic Vicar of the Midland District in England. In 1804 he moved to Wolverhampton and entered into the agitation which finally led to the removal of the right of veto on appointment of Roman Catholic bishops as part of Peel's Catholic Relief Act passed in 1829. His firmness and courage in the controversy won him the sobriquet "the English Athanasius." He wrote: *Antiquities of Winchester* (2 vols., 1798–1801; 3d ed., with memoir by Husenbeth, 1839); *Treatise on the Ecclesiastical Architecture of England during the Middle Ages* (1811; 3d ed., 1835); *The End of Religious Controversy* (1818). Consult: F. C. Husenbeth, *Life of John Milner* (Dublin, 1862); Ward, *Dawn of the Catholic Revival in England, 1781–1803* (2 vols., ib., 1909).

MILNER, Joseph (1744–97). An English ecclesiastical historian. He was born at Leeds in Yorkshire. He studied at Catharine Hall, Cambridge, where he took the degree of B.A. in 1766, and afterward became head master of the grammar school at Hull. In 1768 he was appointed lecturer at Holy Trinity or High Church, Hull, and later became also vicar at North Ferriby, near Hull. Milner's principal work is his *History of the Church of Christ*, of which he lived to complete three volumes, reaching to the thirteenth century (1794–97); vols. iv and v (1803–09) were edited from his manuscripts by his brother, Dr. Isaac Milner, dean of Carlisle, who also published a complete edition of his brother's works in eight volumes (1810). The principles on which the *History of the Church of Christ* is written are of the narrowest kind of evangelicalism. An improved edition by Grantham appeared in 1847. A life of Milner by his brother Isaac is prefixed to the first volume of Milner's *Practical Sermons* (London, 1804–23).

MILNER-GIBSON, Thomas. See Gibson, Thomas Milner-.

MILNES, mīln'z, Richard Monckton, Baron Houghton (1809–85). An English poet and politician, son of Robert Pemberton Milnes, of Fryston Hall, near Wakefield, Yorkshire, born in London, June 19, 1809. He was educated at Trinity College, Cambridge, where he was a member of the famous society called the Apostles, which included Hallam and Tennyson. Soon after receiving the degree of M.A. (1831) he traveled in Germany and Italy and visited Greece. He returned to London in 1835. In 1837 he entered Parliament for Pontefract, which he continued to represent till 1863, when he was raised to the peerage as Baron Houghton. In politics he was at first a Conservative, but on Peel's conversion to free trade he became an Independent Liberal. He was an advocate of public education and religious equality; labored for copyright laws and the establishment of reformatories for juvenile offenders; and took a decided stand on the side of Italy against Austria. A friend of literary men, he secured a pension for Tennyson, helped Hood, and was one of the first to recognize the merits of Swinburne. In 1842–43 he visited the East and in 1875 Canada and the United States. He died at Vichy, Aug. 11, 1885. He is more memorable as a man of influence in the worlds of society and letters than as an original writer, though the delicacy and refinement of his meditative poetry has a narrow appeal. Among Lord Houghton's works are: *Memorials of a Tour in Some Parts of Greece, Chiefly Poetical* (1834); *Poems of Many Years* (1838); *Poems Legendary and Historical* (1844); *Palm Leaves* (1844). He edited *The Life, Letters, and Literary Remains of Keats* (1848). Consult his interesting *Monographs, Personal and Social* (London, 1873); *Collected Poetical Works* (ib., 1876); the character of Vavasour in Disraeli's *Tancred;* T. W. Reid, *Life, Letters, and Friendship of R. M. Milnes* (London, 1890).

MI'LO. A town in Piscataquis Co., Me., 34 miles north-northwest of Bangor, on the Bangor and Aroostook Railroad (Map: Maine, D 3). The town is engaged largely in farming, and there are also manufactories of spools, long lumber, and the repair shops of the Bangor and Aroostook Railroad. Pop., 1900, 1150; 1910, 2556.

MILO. See Melos.

MILO, or **MILON** (Lat., from Gk. Μίλων, *Milōn*) of Croton, in Magna Græcia. A Greek athlete famous for his great strength, who lived, according to Herodotus, about 520 B.C. He won the prize as wrestler in six Olympian, seven Pythian, ten Isthmian, and nine Nemean games. Among other displays of his strength he is said to have on one occasion carried a live ox upon his shoulders through the stadium of Olympia and afterward to have eaten the whole of it in one day; and on another to have upheld the pillars of a house in which Pythagoras and his scholars were assembled, so as to give them time to make their escape when the house was falling. He lost his life through too great confidence in his own strength, when he was getting old, in attempting to rend a tree which woodcutters had partly split with a wedge; as the result of his first effort the wedge fell out, but when he relaxed his muscles for a fresh effort the tree closed upon his hands and held him fast until he was devoured by wolves.

MILO, Titus Annius Papianus (95–48 B.C.). A Roman politician. He was born at Lanuvium and belonged to a distinguished family. Few details of his life are known till his election as tribune of the people in 57 B.C. He was then a partisan of Pompey and attempted to bring about the recall of Cicero from exile. This measure was bitterly opposed by Clodius, who, as tribune of the people, had been instrumental in passing the law condemning Cicero to exile. Milo attempted to have Clodius condemned as a violator of the public peace, but the proceedings were quashed. Both Milo and Clodius now hired a bodyguard of gladiators, and armed collisions between their retainers became almost everyday occurrences. About this time Milo married Sulla's daughter, Fausta, for her fortune. In 56 Clodius was elected curule ædile and accused Milo of being a violator of the public peace by keeping a force of armed retainers. Pompey conducted the defense of Milo, but no decision was ever reached. In 53 Milo offered himself as a candidate for the consulship. Clodius opposed the candidature of Milo, who was defended in the Senate by Cicero in a speech of which some fragments are still extant. On January 18 of the next year Milo was on his way to Lanuvium from Rome, accompanied by 300 persons, many of whom were women and children. Clodius, also with an armed company, met him near Bovillæ. Milo and Clodius passed each other without trouble; but some of Milo's followers picked a quarrel with the slaves of Clodius, who attempted to interpose and was stabbed in the shoulder by one of Milo's men. Clodius was taken to a tavern in Bovillæ, but was dragged out by the slaves of Milo and put to death. The corpse of Clodius was placed on the rostra of the Forum in Rome and a mob set fire to the Senate house. These acts of popular violence created a reaction in favor of Milo, who ventured to return to Rome. He was, however, tried for the murder of Clodius. Cicero defended him, but, intimidated by the violence of Clodius' partisans, failed to do justice to himself or to his client; Milo was condemned to exile and went to Marseilles. Later Cicero rewrote his *Oratio pro Milone;* the latter speech, still extant, has been justly admired both in ancient and in modern times. For a good account of the speech, of the death of Clodius, and the trial of Milo, consult R. W. Husband, "The Prosecution of Milo: A Case of

Homicide, with a Plea of Self-Defense," in *The Classical Weekly*, vol. viii, pp. 146–150, 156–159 (New York, 1915). In his absence he was tried and condemned on charges of violence, of bribery, and conspiracy.

In 48 he went back to Italy, without permission, to join Marcus Cælius, an expelled Senator, who was attempting to excite a rebellion in south Italy.

He was killed before a fort near Thurii. See CLODIUS PULCHER.

MILO, VENUS DI. See MELOS; VENUS OF MILO.

MILORADOVITCH, mē'lō-rä'dō-vĭch, MIKHAIL ANDREIEVITCH, COUNT (1771–1825). A Russian general, born in St. Petersburg. After active service in the war with Turkey and in that with Poland he distinguished himself under Suvarov in the campaign of the Austro-Russian army against the French in Italy (1799) and made the famous passage of the Alps by way of the St. Gotthard Pass into Switzerland. In 1805 he was a division commander at Austerlitz and in 1812 he fought at Borodino. In 1813 he played a prominent part at Lützen. He was made Governor of St. Petersburg in 1819, but six years afterward, as he strove to quell the Decembrist rising, he was shot dead.

MILOSH, mē'lŏsh, OBRENOVITCH (1780–1860). A prince of Servia, born in Dobrinia. He was the son of a peasant and spent his youth and early manhood as a swineherd in the service of his rich half brother Milan, who was one of the leaders in the revolt of 1804. Milosh was his lieutenant and his successor (1810), took his patronymic in place of his own, Todorovitch, and became a leader in the opposition against Kara George. After the latter fled into Austria Milosh stood his ground against the Turks for a time, then surrendered, and was made commandant or "knez" of Rudnik (1813). In 1815, as a result of brave fighting and clever diplomacy, he practically made Servia independent. Two years afterward, having killed Kara George, he was named hereditary and supreme Prince of Servia, a title conferred in 1827 by the National Assembly and recognized by the Porte in 1830. Several revolts came to nothing, but in 1839 he was forced to abdicate in favor of his son, Milan. The next nine years he spent in Vienna and later he settled on his estates in Servia. In 1858 he was recalled to power by the National Assembly and recognized by the Porte in 1859. He was a man of no education, energetic, headstrong, and rather cruel; but he gave Servia a place in European politics. For this he is known as the "father of his country." He was succeeded by his son Michael Obrenovitch III.

MILREIS, mĭl'rās, or **MILREA,** mĭl'rā (Portug., from *mil*, thousand + *reis*, pl. of *real*, small coin). Portuguese and Brazilian coins and money of account, containing 1000 *reis*. The Portuguese gold milreis is equivalent to the escudo, the monetary unit of Portugal, of which the value in United States currency is $1.08. The Brazilian milreis, the monetary unit of Brazil, is a gold coin equal to 54.6 cents value in United States currency, but is not in general circulation. There are silver coins and paper currency of the same name, which fluctuate in value, the paper milreis being quoted by the United States Treasury Department in October, 1914, at about 25 cents United States currency.

MIL'ROY, ROBERT HUSTON (1816–90). An American soldier, born in Washington Co., Ind. He graduated at Norwich University, Northfield, Vt., in 1843, and took part in the Mexican War as captain in an Indiana volunteer regiment. While studying law he served as a member of the Indiana Constitutional Convention in 1849–50 and in 1851 was made judge of the eighth judicial circuit of Indiana. At the outbreak of the Civil War he was made captain, in 1861 was made colonel of volunteers, and finally brigadier general in 1862. In the same year he was promoted to be a major general of volunteers after his service in West Virginia under Generals McClellan and Rosecrans. At Winchester, Va., he opposed for three days a large part of Lee's army, then attempted the invasion of Pennsylvania, and lost heavily. Though he claimed that this detention of Lee was of great advantage to General Meade, enabling him to fight at Gettysburg instead of farther north, an investigation was ordered into his conduct. The charges, however, were dismissed; but he resigned from the army. In 1868 he was trustee of the Wabash and Erie Canal, was superintendent of Indian affairs in Washington Territory from 1868 to 1874, was Indian agent from 1875 to 1885, was reappointed in the latter year, but soon lost his position by the accession to power of the opposite political party.

MILTI'ADES (Lat., from Gk. Μιλτιάδης). 1. A prominent Athenian of the sixth century B.C., son of Cypselus, political adversary of Pisistratus. Herodotus states (vi, 36–37) that, at the request of the Doloncians, as an aid to them against their foes, Miltiades conducted a colony to the Thracian Chersonese. Modern scholars, however, have held rather that Pisistratus, seeking trade in Thrace and along the Hellespont, sent out the colony and put Miltiades in charge to remove a rival from Athens. 2. A famous Athenian general, son of Cimon (q.v.). He became "tyrant" of the Chersonesus after his brother Stesagoras, and accompanied Darius Hystaspis in his expedition against the Scythians, about 508 B.C. (See DARIUS I.) He was one of those who were left by Darius in charge of the bridge over the Danube, and, when Darius failed to appear at the expected time, he advised that the bridge be destroyed and Darius left to his fate. This story, told by Herodotus, vi, 40, modern scholars doubt. Consult W. W. How and J. Wells on Herodotus, l.c. (Oxford, 1912). Afterward he took Lemnos from the Persians, but, when the Persian fleet came near the Chersonesus, fled to Athens. Being chosen one of the 10 generals of the year 490 B.C., he defeated the Persians in that year in the great battle of Marathon (q.v.). Later he was intrusted by the Athenians with a fleet of 70 ships, with which he proceeded against Paros for the purpose of avenging a private grudge. The expedition having failed, he was, on his return to Athens, condemned to pay a fine of 50 talents. Being unable to do this, he was thrown into prison, where he died of an injury received at Paros. The biography of this Miltiades by Cornelius Nepos (q.v.) is extant.

MILTIADES, SAINT, less correctly called MELCHIADES. Pope 311–314. He was born in Africa and his pontificate covers the eventful period of Constantine's conversion. Under him a synod was held in Rome in 313 and a decision was rendered against the Donatists (q.v.). His day is December 10.

MIL'TITZ, Karl von (c.1480–1529). A German ecclesiastic of the Roman Catholic church, the son of a Saxon noble. He was canon at Mainz, Treves, and Meissen before he became papal chamberlain and notary in 1515. Three years afterward he was sent by Pope Leo X to Saxony on the mission to confer with Martin Luther and his protector, the Elector Frederick the Wise, in the matter of indulgences. An able and politic advocate for a compromise, Miltitz so far succeeded that Luther promised future submission, if not recantation; but though later meetings took place between the two at Liebenwerda and Lichtenberg, the hope of reconciliation was definitely abandoned on the arrival of a denunciatory papal bull. Miltitz was charged also with an investigation into the conduct of Tetzel, whom he condemned. Consult his biography by Creutzberg (Freiburg, 1907).

MIL'TON. A town and the capital of Halton County, Ontario, Canada, on the Canadian Pacific and Grand Trunk railways, about 30 miles southwest (direct) of Toronto (Map: Ontario, E 6). It has manufactories of lumber, flour, wire nails, cream, pressed brick, boots and shoes, crushed stone and lime, wood screws and rivets, carpets, nickel and silver plating, and electric motors. The town possesses two parks and owns its electric-lighting and water works. Pop., 1911, 1654.

MILTON. A town, including the villages of East Milton, Lower Mills, and Mattapan, in Norfolk Co., Mass., 7 miles south of Boston, on the Neponset River and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 3). It is an attractive residential suburb of Boston and has a public library, Milton Academy, and other institutions. In proportion to its size it is a very wealthy town, its valuation in 1914 being $31,602,839. The crest of the highest hill (635 feet) of the Blue Hills is the site of a meteorological observatory, conducted by Harvard University. A fine view is afforded. The town has granite quarries and chocolate and cracker factories. The government is administered by town meetings. There are municipal water works. Pop., 1900, 6578; 1910, 7924. Settled in 1637, Milton was a part of Dorchester until, in 1662, it was incorporated as a separate township. It was the home for many years of Jonathan Belcher, a Colonial Governor of both Massachusetts and New Jersey, and of Thomas Hutchinson, the historian and Colonial Governor of Massachusetts. It is also the site of the famous Suffolk Resolves house. Consult Teele (editor), *History of Milton, Mass.* (Milton, 1887).

MILTON. A borough in Northumberland Co., Pa., 50 miles north of Harrisburg, on the Susquehanna River, on the Pennsylvania Canal, and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, H 4). Its extensive manufacturing plants include car and woodworking machinery shops, rolling, flour, knitting, planing, and saw mills; washer, nut, and bolt works; and furniture, shoe, couch, nail, fly net, bamboo novelty, and paper-box factories. The borough has a public park with picturesque scenery; and a fine bridge spans the Susquehanna at this point. Settled in 1770, Milton was incorporated first in 1817. It is governed, under a revised charter of 1890, by a chief burgess, elected every four years, and a unicameral council. Pop., 1900, 6175; 1910, 7460.

MILTON, John (1608–74). An English poet. He was born in Bread Street, London, Dec. 9, 1608. His father, also named John Milton, belonged to a Roman Catholic family of yeomen living in Oxfordshire. The elder John Milton was converted to Protestantism while a student at Oxford, and as a result was promptly disinherited by his father, Richard Milton. The poet's father settled in London, where he prospered as a scrivener. The younger John Milton received instruction from his father in music, was taught by a private tutor, and was sent to St. Paul's School (about 1620), where he learned Latin, Greek, French, Italian, and some Hebrew, and read English literature. Spenser's *Faerie Queene* and Sylvester's translation of Du Bartas, which came into his hands at this time, exerted much influence on the formation of his style. In February, 1625, he proceeded to Christ's College, Cambridge. He was of less than the middle height, yet well made, with light brown or auburn hair. In bearing he was courteous and stately, though sometimes sarcastic. Owing to a quarrel with his first tutor he was rusticated for a short time in 1626, but he returned and completed the course, graduating B.A. in 1629 and M.A. in 1632. From childhood Milton had been destined for the Church, but the policy of Laud led him first to postpone taking orders and then to abandon all thought of it. He retired to his father's estate at Horton, Buckinghamshire, where he passed nearly six years (1632–38) in reading the classics and writing at intervals his choicest poems. Believing that he had it in him to write something that would live, he set out for Italy in April, 1638, wishing to fit himself still more for his future work. Probably at Bologna, which he visited in 1639, Milton wrote in excellent Italian five sonnets and a canzone wherein he expresses love for a beautiful lady of Bologna. For some time he stayed in Florence, where he visited in prison the blind Galileo. Thence he went on to Rome and Naples. As he was about to pass over to Sicily and from there to Greece, news reached him of "the civil commotions in England." He turned homeward, reaching England towards the end of July, 1639. He took a house in Aldersgate Street, London, where he received as pupils two nephews, children of an elder sister, and occupied his leisure with plans for future poems. From these pursuits he was drawn into ecclesiastical controversies, writing pamphlet after pamphlet. In June, 1643, he married, after a brief courtship, Mary Powell, then only 17 years old, the daughter of an Oxfordshire squire and Royalist. After a month the bride returned to her father's house. In the summer of 1645 they were reconciled, and he moved to the Barbican, a more commodious house for the increasing number of his pupils. His wife died in 1652, after bearing four children, of whom the one son died in infancy. A fortnight after the execution of Charles I (Jan. 30, 1649) Milton issued a memorable defense of the deed, and this led to other pamphlets which gave him European fame as a controversialist. On the establishment of the Commonwealth Milton was appointed Latin secretary to the Council of State (March 15, 1649). For this office, involving the duty of turning into Latin all foreign dispatches, he was eminently fitted. In 1652 he lost his eyesight, already long impaired, but with the aid of assistants—one of whom was Andrew Marvell—he performed the duties of his

post till the abdication of Richard Cromwell (1659). In the meantime (November, 1656) he had married a Catharine Woodcock, who died in February, 1658. She was honored by one of Milton's most beautiful sonnets (xxiii). The Restoration put an end to his active career. In 1661 he settled in Jewin Street, Aldersgate, from which he removed about two years later to a house in Artillery Walk, Bunhill Fields, his last residence. Here he fulfilled the literary task he had long ago planned and since begun. In 1663 he married a third wife, 30 years his junior, named Elizabeth Minshull. His relations with his daughters were most unhappy. Brought up in ignorance, they revolted from the service that he demanded of them—reading to him Latin, Greek, and Hebrew, which of course they could not understand. Towards the end Milton stood aloof from religious sects and services. He died Nov. 8, 1674, and was buried in St. Giles's, Cripplegate.

Milton's literary career is clearly divided by the outbreak of the Civil War and by the Restoration into three periods: (1) 1626–40; (2) 1640–60; (3) 1660–74.

First Period. Milton began writing English and Latin verse while a schoolboy. The earliest extant specimens of these exercises are paraphrases of the 114th and 136th Psalms, composed at the age of 15, and some Latin verses. To his Cambridge period belong a group of Latin poems (1626–28); "On the Death of a Fair Infant" (1626); "At a Vacation Exercise" (1628); "Hymn on the Morning of Christ's Nativity" (1629); the fragment "The Passion" and "Song on May Morning" (both probably 1630); "On Shakespeare" (1630); and sonnets "To the Nightingale" (probably 1630) and "On Arriving at the Age of Twenty-three" (1631). The Latin verses are undoubtedly the best ever written by an Englishman, and the best of the English poems display high poetical genius. While at Horton, Milton composed four perfect poems: the two descriptive lyrics, "L'Allegro" and "Il Penseroso" (probably written in 1632); "Comus," a masque performed at Ludlow Castle on Michaelmas night, 1634, in honor of Lord Bridgewater's appointment to the wardenship of the Welsh marches; and "Lycidas," a pastoral elegy in memory of his college friend Edward King, drowned on his passage to Ireland (Aug. 10, 1637). Of these poems, which by themselves would give Milton a high place in English literature, only a few had been published. The lines on Shakespeare appeared in the second folio of the dramatist's works (1632); Henry Lawes, who composed the music for "Comus," published the masque anonymously (London, 1637), and "Lycidas" formed one in a collection of memorial poems (Cambridge, 1638). To this period belong five sonnets and a canzone in Italian and Milton's two finest Latin poems: "Mansus" (1638), addressed to the Marquis of Manso, the friend of Tasso, who in his old age hospitably received Milton at Naples; and "Epitaphium Damonis," an elegy on the death of his college friend Charles Diodati.

Second Period. For full 18 years Milton was distracted from poetry by the revolutions in church and state, and doubtless also by his own domestic perplexities. The separation from his wife led to pamphlets on divorce, of which the most important are "The Doctrine and Discipline of Divorce" (Aug. 1, 1643) and "The Tetrachordon" (1645). Against episcopacy he launched, in 1641–42, five tracts, of which the best known is "The Reason of Church Government Against Prelaty." In 1644 appeared the valuable letter "Of Education" and a noble plea for the freedom of the press under the title "Areopagitica." The execution of Charles I and the establishment of the Commonwealth were defended against continental criticism in "The Tenure of Kings and Magistrates" (1649), "Eikonoklastes" (1649), "Pro Populo Anglicano Defensio" (1651), and sequels. These tracts, vehement and often scurrilous in style, contain autobiographical passages of interest. Throughout this period Milton wrote almost no verse. He composed, however, at intervals his magnificent sonnets, as "On his Blindness," "To Fairfax," "To Cromwell," and "The Massacre in Piedmont"; and the first edition of his collected poems was published, probably early in January, 1646, though dated 1645. Besides this he wrote some Greek and Latin verse and made a few translations. In 1648 there appeared a romance in Latin, in mixed prose and verse, and entitled "Nova Solyma," which was translated (New York, 1902) by the Rev. Walter Begley, and by him attributed to John Milton—an attribution which has not been generally sanctioned, however, by scholars.

Third Period. The great epic that Milton now composed is the spiritual summary of his life of lost ideals. As early as his return from Italy, he had meditated the production of some great poem. By 1642 his mind was turning towards a play on the loss of paradise. When he resumed the subject in 1658, it took the form of an epic. "Paradise Lost," in 10 books, completed by 1665, perhaps even by 1663, was first published in 1667. After several reprints with slight changes, it was enlarged to 12 books (1674). For this poem, of which 1300 copies were sold in 18 months, Milton received from his publisher £5 down, and an agreement to pay the poet £15 more in three installments on condition of the sale of a certain number of copies. At the suggestion of Thomas Ellwood, a Quaker friend of the poet, Milton wrote "Paradise Regained," which was published with "Samson Agonistes," a lyrical drama, in 1671.

Once Milton was known mainly as the author of "Paradise Lost." Since the romantic revival, the minor poems, touchstones of poetic taste, have taken a secure place beside this epic. The glow and romance of the imaginative state in which the early lyrics were conceived certainly departed from Milton during the civil conflict. But as years went on his imagination became invested with sublimity. Had "Paradise Lost" been written in 1642, it would have been a perfect mystery play, as "Comus" is a perfect masque. Delayed 20-odd years it became a sonorous epic, which, though barren in places, abounds in the noblest English poetry.

Bibliography. For his biography, consult: Edward Phillips's (Milton's nephew) memoir in his *Letters of State* (London, 1694); David Masson, *Life of John Milton, Narrated in Connection with the Political, Ecclesiastical, and Literary History of his Time* (new and rev. ed., 7 vols., London, 1877–96), exhaustive and authoritative; Mark Pattison, in the "English Men of Letters Series" (New York, 1880); Richard Garnett, in the "Great Writers Series" (London, 1890); Masterman and Mullinger, *The Age of Milton* (ib., 1897); "The Earliest Life of Milton," written by a contemporary of the poet and

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reprinted in *Colorado College Studies* (No. x, Colorado Springs, 1903). For works, consult: *The Poetical Works of Mr. John Milton* (London, 1695), the first complete edition of his poetry; *Poetical Works*, edited by H. J. Todd (6 vols., ib., 1801), by J. Mitford (Aldine edition, 3 vols., ib., 1832); *Prose Works*, edited by St. John, Bohn's Library (5 vols., ib., 1848–53); *Poetical Works*, edited by Keightley (2 vols., ib., 1859); *Poetical Works*, edited by Masson (Cabinet edition, with memoir and excellent and complete editorial equipment, 3 vols., ib., 1890); John Bradshaw (comp.), *Concordance to the Poetical Works of John Milton* (ib., 1894); *Facsimile of Milton's Minor Poems*, from manuscripts in Trinity College, Cambridge, edited by Wright (Cambridge, 1899); *Poetical Works after the Original Texts*, i.e., reprints, edited by Beeching (Oxford, 1900). For estimate, consult: essays by Dr. Johnson (London, 1779), T. B. Macaulay (ib., 1840), J. R. Lowell (ib., 1845); W. P. Trent, *A Short Study* (New York, 1899); Hiram Corson, *An Introduction to Works*, containing the prose autobiographical pieces (ib., 1899); the notable *Study*, by Sir Walter Raleigh (ib., 1900). The student will find of much value C. G. Osgood, *The Classical Mythology of Milton's English Poems* (New York, 1900), and L. E. Lockwood, *Lexicon to the Poetical Works of John Milton* (ib., 1902). A valuable study is that of Robert Bridges, *Milton's Prosody* (London, 1893). Concerning sources and other questions there is good matter in Marianna Woodhull, *The Epic of Paradise Lost* (New York, 1907). In 1908, on the tercentenary of Milton's birth, an exhibition of editions and portraits of Milton was held, and the *Catalogue* (London, 1908) of this exhibition is bibliographically and iconographically valuable. There is matter of interest in S. G. Spaeth, *Milton's Knowledge of Music* (New York, 1913); in J. M. Bailey, *Milton and Jakob Boehme* (Oxford, 1914); and in E. N. S. Thompson, *Essays on Milton* (New York, 1915).

MILTON COLLEGE. A coeducational institution for higher education, founded at Milton, Wis., under the auspices of the Seventh Day Baptists. The college was incorporated under its present name in 1867, and it succeeded Du Lac Academy, founded in 1844 and in 1848 renamed Milton Academy. There are on the campus four buildings devoted to educational purposes, the last of these being a gymnasium, also used as an auditorium, erected in 1911 at a cost of $22,000. The college includes collegiate and academic departments and a school of music. In 1914–15 the total attendance in all departments was 145, with 14 members in the faculty. The value of the property owned by the college was $200,000, the buildings and grounds being valued at $65,000 and the equipment at $12,000. There is an endowment of $135,000, and the annual income is about $12,000. In the library are about 9500 volumes and 500 pamphlets. The president in 1915 was W. C. Daland, A.M., D.D.

MILUTIN, mĭl-yōō′tĭn, Dmitri Alexeievitch, Count (1816–1912). A Russian general and military reformer. He was born in Moscow, entered the army in his youth, and was appointed chief of staff in the Caucasus in 1856. In 1862, after submitting his programme for a reform of the Russian army, he was made Minister of War, a place he held till 1881. In 1898 he was made field marshal. Milutin wrote on the campaign of 1839 in northern Daghestan and on Suvarov's campaign of 1799 against France—*A History of the War of 1799 between Russia and France in the Reign of Czar Paul I* (1853). The latter ranks very high among military annals.

MILUTIN, Nikolai (1818–72). A Russian statesman, brother of Count Dmitri. In Alexander II's reforms he took a prominent part, especially in the reorganization of credit, in the introduction of provincial institutions centring on the *mir*, in the emancipation of the serfs, and in agrarian commissions in Lithuania in 1863 and in Poland in 1864. He was Secretary of State for Poland from 1866 to 1868. He wrote on Russian military statistics. Consult Leroy-Beaulieu, *Un homme d'état russe* (Paris, 1884).

MIL′VIAN, or **MULVIAN BRIDGE.** An ancient bridge over the Tiber at Rome, built in 109 B.C. by Marcus Æmilius Scaurus, on the famous Flaminian Way (q.v.). At this bridge, in 63 B.C., Cicero caused the arrest of the ambassadors of the Allobroges, who were conspiring with Catiline, and Maxentius was drowned there after his defeat by Constantine in 312 A.D. On the foundations of the ancient bridge stands the modern Ponte Molle. Consult S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., New York, 1911).

MILWAUKEE, mĭl-wô′kē. The largest city in Wisconsin, a port of entry, and the county seat of Milwaukee County. It is situated in the eastern part of the State, on the west shore of Lake Michigan, 85 miles north of Chicago, and 82 miles east of Madison, the State capital (Map: Wisconsin, F 5). The city occupies an area of about 26 square miles, trisected by the Milwaukee River and its affluents, the Menominee and Kinnickinnic, all of which have been dredged and widened to permit passage into the heart of the city of large freight and passenger vessels. Much of the residence section of Milwaukee is upon a bluff rising 150 feet above Lake Michigan and 650 feet above sea level. Upon this bluff and ranging northerly and westerly from the business quarter are broad well-paved streets, characterized by shade trees and detached houses. The park and boulevard system, the graceful sweep of the bay with its prongs—North Point and South Point—projecting far into the lake, the city's proximity to well-known health and pleasure resorts, and its cluster of busy and beautiful suburbs all combine to make Milwaukee one of the most attractive of American cities. Among its suburbs are St. Francis, the seat of Pio Nino College and other Catholic institutions; West Allis, containing the State fair grounds and the immense machinery plant of the Allis-Chalmers Manufacturing Company; and Wauwatosa, the seat of a group of county institutions: almshouses, hospital, chronic insane asylum, hospital for the insane, and a children's home; here also is a national soldiers' home, occupying 400 acres of ground. A little further removed are the suburbs South Milwaukee and Cudahy, abounding in large manufacturing establishments. The park and boulevard system is a recent and rapid development. The city owns 940 acres of parks, under the control of commissioners, appointed by the mayor. The largest of these parks are Evergreen (180 acres), Washington (150 acres), Lake (125 acres), Jackson (80 acres), Mitchell (63 acres), Humboldt (46 acres), and Kosciusko (37 acres). All are beautifully laid out,

and most either include or are bordered by bodies of water. They are rendered more attractive by golf links, tennis courts, play grounds, a zoo (in Washington Park), and statues of distinguished men—Goethe, Schiller, Kosciusko, Robert Burns, Leif Ericson, Henry Bergh, and Solomon Juneau, the founder of Milwaukee. There is also a soldiers' monument on a sightly situation on Grand Avenue. Forest Home cemetery abounds in monuments of taste and beauty. Store and residence buildings were formerly constructed for the most part of cream-colored bricks, from which Milwaukee became known as "The Cream City." Vitrified brick, however, is rapidly superseding this type of block, and new and ample structures arise in marble. The Wells, Pabst, Majestic, and First National Bank buildings are instances of the city's handsome business edifices. The Marshall and Ilsley Bank building, occupied in 1913, and the Northwestern Mutual Life Insurance Company building, completed in 1914, are particularly noteworthy—the former of Ionic architecture, and the latter a stately structure with Corinthian columns and pilasters. St. Paul's church (Protestant Episcopal), the Immanuel Presbyterian church, and the Jesuit church of the Gesu are also of great beauty. A Roman Catholic archbishopric and a Protestant Episcopal bishopric have sees in Milwaukee. The United States contributes to the architecture of Milwaukee by means of a large granite post-office building; the county of Milwaukee by a brown sandstone court and records building; and the city by its municipal house or city hall, situated on a triangular plat and surmounted by a commanding tower. Other prominent features are the public library and museum, containing 288,360 volumes, and among other rarities, the notable Nunnemacher collection of fire arms; and the art gallery, founded and endowed by Frederick Layton, and containing a choice collection of modern canvases, including *The Departure of the Mayflower*, by George H. Boughton, R.A. The public schools of Milwaukee are controlled by a board of school directors, 15 in number, elected by popular vote for a term of six years. Connected with the system are schools for the blind and deaf, vocational schools, and a fresh-air school. A fine State normal school is situated in the outskirts of the city. In addition to these there are a number of parochial schools, and Concordia College (Lutheran), established in 1881; Marquette University (Jesuit), founded in 1881; and Milwaukee-Downer College and Milwaukee-Downer Seminary, founded in 1849, both for women. Milwaukee's finest hospital is St. Mary's, with a new and splendidly equipped building, situated upon a sightly bluff of Lake Michigan's shore. In its immediate vicinity is a group of eleemosynary institutions, conspicuous among which are the Wisconsin Industrial School for Girls and the Milwaukee Protestant Home for the Aged. By the water of the lake, near the foot of these buildings, begins the Lake Shore Drive, which is to be a portion of the boulevard and park system, and which will surround practically the entire urban district. Pop., 1840, 1712; 1850, 20,061; 1860, 45,246; 1870, 71,440; 1880, 115,587; 1890, 204,468; 1900, 285,315; 1910, 373,857; 1914 (U. S. est.), 408,683; 1920, 457,147. In population Milwaukee ranks as the thirteenth city in the United States.

Its executive officer is a mayor, its legislative body a board of 37 aldermen, one chosen from each of the 25 wards and 12 at large. A treasurer, a comptroller, an attorney, seven civil judges of limited jurisdiction, and constables are also elected by the voters of the city. Various administrative boards are appointed by the mayor, subject to confirmation by the aldermen. Minor positions are filled upon examination by civil-service boards. The tax assessment is made by ward assessors, who, with the mayor, city clerk, and tax commissioner, constitute a board of review of assessment rolls.

In 1914 the bonded debt of Milwaukee was $10,577,500 and its floating debt $1,714,600. The statutes limit the borrowing power of the city to 5 per cent of the average assessed valuation of property for five years. While the basis of assessment prescribed by law is the full value of real and personal property, practice has fixed it at about 90 per cent of the full value. The rate in 1914 was $13.79. During 1913 the receipts of the city from all sources were $16,881,587. Of this amount, $6,859,937 came from general property taxes and $6,774,437 from sales of investments. The expenditures during the same year amounted to $10,369,505, of which $2,344,697 was expended for schools, $618,142 for the police department, $725,186 for the fire department, $468,968 for interest on the city's debt, and $801,074 for water works. In 1913 the assessed valuation of all property was $460,548,763, of which $368,664,865 was real property and $91,883,898 personal. The water works of the city, begun in 1872, and now including 505 miles of mains, have cost Milwaukee $7,485,000.

Milwaukee is favorably situated with reference to extensive resources of farm, mine, and forest. It enjoys the advantages of water transportation afforded by the Great Lakes, in addition to excellent railroad facilities. Among the railways that enter the city are the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, the Minneapolis, St. Paul, and Sault Ste. Marie, and, by lake ferry, the Grand Trunk and the Pere Marquette. The city has become important both as a collecting and a distributing centre, and is noted also for its manufacturing enterprises. There is an excellent harbor protected by a breakwater. In the shipments eastward there is competition between the lake system of transportation and the railroads, while a considerable traffic crosses Lake Michigan and finishes its transit east by rail. In the lake commerce the shipments far exceed the receipts. The principal commodity received from the East is coal, which reaches Milwaukee by way of the lakes. The following table shows the receipts and shipments of the principal articles for the year 1913.

COMMODITIES		Receipts	Shipments
Flour	barrels	3,161,287	3,490,922
Wheat	bushels	7,372,650	3,986,911
Corn	"	13,140,650	8,956,897
Oats	"	15,972,900	13,599,348
Barley	"	18,897,700	5,017,218
Rye	"	3,081,100	2,397,700
Lumber	feet	*301,830,000	*81,854,000
Coal	tons	*5,860,263	*1,000,599

* Lake traffic only.

With respect to corn and oats the city is primarily a distributing rather than a consuming centre. It will be noted, however, that there is a marked difference between the receipts and

the shipments of barley and wheat, Milwaukee being a large consumer of these products in the milling and brewing industries. Barley is used principally in the manufacture of beer, which is one of the most notable industries of the city. No other American city enjoys so high a reputation for its beer, although the manufacture of this product is not the most important industry. In 1913 the product of Milwaukee's chief manufacturing industries, according to local figures, was valued as follows: iron, steel, and metal products, $46,519,509; leather and shoes, $40,569,000; meat and packing-house products, $30,500,000; beer, $25,381,615; and flour and mill products, $8,412,100. The value of all manufactured products in that year was $420,116,266.

History. Lieut. James Gorrell, an English officer who visited the site in August of 1762, writes of "Milwacky" as an Indian town with an English trader residing there. This trader may have been Alexander Henry, a native of New Jersey, who made yearly visits to Milwaukee from about 1760 to 1765. Henry was followed by Alexander La Framboise, who in 1784 had substantial holdings at the mouth of the Milwaukee River. In about 1789 two French Canadians, Jean Baptiste Mirandeau and Jacques Vieau, visited the place. Mirandeau's stay was practically continuous until his death in March, 1819. Vieau made annual visits until about 1805, when he established himself permanently. On Sept. 12, 1818, Laurent Solomon Juneau (q.v.) arrived in Milwaukee and became Vieau's clerk and later his son-in-law. Juneau is considered the first permanent white settler of Milwaukee and, with his wife, exerted a vast influence over the neighboring Potawatami and Menominee tribes. From the Indians Juneau received extensive grants of land, but in subsequent treaties with the Indians these passed to the general government. The practical extinction of the Indian titles made Milwaukee an attractive place for settlers from eastern States. Moreover, the close of the Black Hawk War in 1832 directed attention to the west shore of Lake Michigan and in 1836 settlers came in considerable numbers. At an election for local officers held Sept. 17, 1835, 39 persons voted. On Jan. 16, 1838, Milwaukee was incorporated as a village by the Territorial Legislature and eight years later was granted a city charter. Juneau was elected the first mayor.

Consult: Wheeler, *Chronicles of Milwaukee* (Milwaukee, 1861), and Buck, *Pioneer History of Milwaukee* (3 vols., ib., 1876–84), the third volume of which is entitled *Milwaukee under the Charter.*

MILYUKOV, mĭl′yōō-kôf′, Pavel Nikolaevitch (1859–). A Russian historian and political leader, born near St. Petersburg. He studied in Moscow and was tutor in history at the university (1886–95). Banished from Russia because of his liberal views, he served as professor of history at the university of Sofia, Bulgaria, in 1897–98, traveled extensively both in Europe and in America in 1902–05, and from 1901 to 1905 was a member of the faculty of the University of Chicago. There he delivered lectures on historical and political subjects, among them a course on *Russia and its Crisis* (published 1905). He returned to Russia in that year, on the outbreak of the revolutionary movement following the St. Petersburg massacre of January 22, was imprisoned for some time, was active in forming the powerful Union of Unions comprising the professional classes in the Empire, and was elected to the first Duma as a Constitutional Democrat. His election was annulled and he was even arrested while the Duma was in regular session, but was liberated after a month's confinement in prison. Despite this governmental reprobation, he remained the most prominent representative of the Constitutionalist party in that Duma and for long afterward. He was a member of the Balkan Committee of Inquiry which investigated the conduct of the War of 1913. He edited the Constitutional-Democrat organs the *Free Nation* and *Popular Rights* until they were stopped by Russian censorship, and later he became editor of the influential St. Petersburg newspaper *Rêtch.* Milyukov was a prolific writer. Besides contributions to magazines, he published: *Main Currents of Russian Historical Thought* (1893–95); *Sketches of the History of Russian Culture* (1895–96); *Russia and its Crisis* (1905); *Democracy and the Second Duma* (1905); *A Year of Struggle* (1907); *The Balkan Crisis and Politics* (1910).

MILYUTIN, Dmitri and Nikolai. See Milutin.

MILZBRAND. See Anthrax; Malignant Pustule.

MIMAMSA, mē-mäm′sȧ (Skt. *mīmāṁsā,* investigation, discussion). The collective name of two of the six orthodox systems of Hindu philosophy. The two Mimamsa divisions are: first, the *Pūrva-mīmāṁsā,* "Prior Inquiry" or *Karma-mīmāṁsā,* "Inquiry concerning Works"; the second is *Uttara-mīmāṁsā,* "Later Inquiry" or *Brahma-mīmāṁsā,* "Inquiry concerning the Supreme Spirit," or, more commonly, simply *Vēdānta* (see Vedanta). The former deals chiefly with the Vedic ritual and its significance, the latter with speculations as to the nature of the Supreme Spirit.

The reputed founder of the system is Jaimini, and the principles are embodied in a series of *Sūtras,* or aphorisms, in 12 books, discussing the sacred ceremonies of the Veda and the merit accruing from their proper performance. The oldest extant commentary on this obscure work is the *Bhāshya* of Çabara-Svāmin, whose date is placed long after the birth of Christ. This composition in turn was critically annotated, about 700 A.D., by the great Mimamsa authority, Kumārila. An early treatise on the subject was an essay on the Mimamsa by Colebrooke in 1826, reprinted in his *Miscellaneous Essays* (London, 1873). Consult: Cowell and Gough, *The Sarva-Darśana-Samgraha of Madhava Achārya* (London, 1894); R. K. von Garbe, *Philosophy of Ancient India* (2d ed., Chicago, 1889); Max Müller, *The Six Systems of Ancient Indian Philosophy* (New York, 1903); Macdonell, *Sanskrit Literature* (London, 1913).

MIMBAR, mĭm′bär. See Mosque.

MIME, mīm (Lat. *mimus,* from Gk. *μῖμος, mimos,* imitator, actor, sort of drama). A species of popular comedy among the ancients, in which scenes of common life were represented with imitative gestures and dancing, and with jocose dialogue more or less freely improvised. It was said to have been invented by Sophron of Syracuse, who wrote in the Doric-Greek dialect. Mimes were a favorite amusement of convivial parties, the guests themselves being commonly the performers. In the hands of such writers as Laberius and Publilius Syrus the mime included much homely wisdom in the shape of

familiar saws and proverbial lines. In the theatres mimes came to be used later as afterpieces. The actors, themselves called mimes (*mimi*), appeared in front of the stage, without buskins or masks, but attired in patchwork cloaks (*centunculi*), as were the harlequins (q.v.) of a later day. Consult: C. J. Grysar, *Der römische Mimus* (Vienna, 1854); Patin, *Etudes sur la poésie latine* (Paris, 1875); Friedländer, *Sittengeschichte Roms*, vol. ii (Leipzig, 1890); Teuffel and Schwabe, *History of Roman Literature* (Eng. trans., London, 1900); Edmond Faral, *Mimes français du XIIIe siècle* (Paris, 1910).

MIM'EOGRAPH. See COPYING MACHINES.

MIME'SIS. See ORTHOGRAPHY, FIGURES OF.

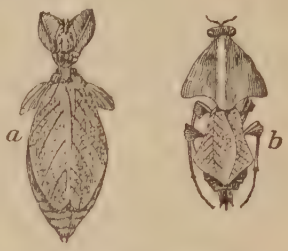
MIM'ETITE. A lead arsenate and chloride closely resembling pyromorphite, occurring in yellow, brown, or white hexagonal crystals.

MIM'ICRY (from *mimic*, from Lat. *mimicus*, mime). A form of protective resemblance by which one species so closely resembles another in external form and coloring as to be mistaken for it, although the two may not be really allied and often belong to distinct families or orders. As early as 1746 Rösei von Rosenhof in his *Insekten-Belustigungen* drew attention to the resemblance which geometric caterpillars, and also certain moths when in repose, present to dry twigs, and thus conceal themselves; and afterward Erasmus Darwin, in his *Zoönomia* (1794), sketched out the subject.

Bates's Theory of Mimicry. These facts received little attention, however, until 1862, when Bates proposed a general theory to account for them. He found during many years' residence in Brazil strikingly colored butterflies belonging to the brilliantly colored family Heliconidæ, and associated with them and indistinguishable, except on close examination, certain butterflies belonging to the structurally very different family of Pieridæ; also certain swallowtail butterflies and day-flying moths. None of the mimicking insects were as abundant as the Heliconidæ they resembled. The Heliconidæ have an offensive taste and odor, in consequence of which they are immune from attacks by insectivorous animals; they fly deliberately, and they make no attempt

MIMICRY IN BUTTERFLIES.
a, *Methona psidii* (Heliconidæ); *b*, *Leptalis orise* (Pieridæ).

at concealment, although their bright distinctive colors permit them to be recognized and avoided as obnoxious. If any other butterflies in the same region were to become indistinguishable from the Heliconidæ they would profit by a corresponding immunity from attack. The theory assumes that some of the Pieridæ happened at the start to resemble the primitive Heliconidæ and received a partial immunity as a result; that such Pieridæ alone survived and produced descendants of like character; and that a selection of the most heliconid-like of these followed. By a continuation of this process the pierids and the other Lepidoptera gained their present close resemblance to the Heliconidæ. The theory is a broad one and accounts for cases of mimicry in other groups of Lepidoptera as well as in other orders of animals. It is not necessary, however, to go to South America for examples of mimicry. In North America, as well as in Asia and Africa, occurs the genus *Danais*, which is also a protected form. The common American species *Anosia plexippus* is closely mimicked by *Basilarchia disippus*, a butterfly of rather remote affinities. Three genera of Danaidæ in tropical Asia, *Euplœa*, *Danais*, and *Hestia*, are very different, but are all protected. In each genus certain species are mimicked with extraordinary accuracy by species of the genus *Papilio*.



MIMICRY IN INSECTS.
a, a leaflike grasshopper (*Phyllium siccifolium*); *b*, a mantis (a *Canthops*) which feeds on insects found among dry leaves and is benefited by resembling them.

But mimicry is not confined to the Lepidoptera. Especially well protected wasps and bees have many imitators, and there are cases of mimicry even in vertebrates.

Müller's Theory of Mimicry. In 1879 Fritz Müller, as the result of many years' observation in southern Brazil, proposed a modification of and addition to the foregoing explanation of Bates. Bates himself, when first describing the cases he observed, had suggested that they might be due to some forms of parallel variation dependent on climatic influences, and Wallace (*Island Life*, p. 255) adduced other cases of coincident local modifications of color, which did not appear to be explicable by any form of mimicry. Müller's theory is founded on the assumption that insect-eating birds only learn when young and by experience to distinguish the edible from the inedible butterflies, and in doing so necessarily sacrifice a certain number of distasteful butterflies. "Now," says Müller, "if two distasteful species are sufficiently alike to be mistaken for one another, the experience acquired at the expense of one of them will likewise benefit the other; both species together will only have to contribute the same number of victims which each of them would have to furnish if they were different. If both species are equally common, then both will derive the same benefit from their resemblance—each will save half the number of victims which it has to furnish to the inexperience of its foes. But if one species is commoner than the other, then the benefit is unequally divided, and the proportional advantage for each of the two species which arises from their resemblance is *as the square* of their relative numbers." Wallace, who fully accepts Müller's theory, in his statement of the theory (*Darwinism*, p. 253) adds: "But if the

two species are very unequal in numbers, the benefit will be comparatively slight for the more abundant species, but very great for the rare one. To the latter it may make all the difference between safety and destruction."

The facts of mimicry are very remarkable; as to causes there is much difference of opinion. The theory of Bates is accepted by many; also that of Müller. Others, like Eimer, Elwes, and Piepers, deny that the mimicry is due to natural selection, but rather to definitely directed evolution, the result of "outward influences such as climate, nutriment, etc., acting on a given constitution." Others, rejecting the Müllerian theory, accept Bates's facts, but ascribe more to the influence of the local environment, such as the action of light, heat, dryness or moisture, etc., yet allowing that in the end natural selection may act as a preservative agent.

The objections to the Müllerian theory are the following: neither Bates nor Wallace himself, though each lived for several years and collected butterflies in the American tropics, ever actually saw a bird chase and devour a butterfly, although insectivorous birds are said by them to be abundant in Brazil and the Eastern Archipelago. Piepers, Pryor, Skertchley, and other tropical naturalists of long and intelligent experience agree that very rarely has any bird been seen even to chase a butterfly; while Judd concludes from an examination of stomachs of insectivorous birds that none of the American birds feeds upon butterflies "during any month of the year to the extent of one-tenth of 1 per cent of its food." Ornithologists confirm this abstinence from eating butterflies. From these and numerous other cases it appears that butterflies enjoy a peculiar immunity from the attacks of birds.

It is sometimes the case that it is difficult to tell which is the model and which the mimic. On the Solomon Islands a dark-brown *Euplœa* and a *Danais*, both inedible, were accompanied by a *Hypolimnas* butterfly, also inedible, all three genera being avoided by birds both in the larva and imago stages. The fact, says Packard, that the mimickers belong to more primitive groups than the models, and that they are as a rule rare and apparently on the verge of extinction, indicates that they are the relics of an earlier geological period, and having been exposed to the same local and modifying changes in the environment as the models, have thus been preserved. Most of the cases of mimicry are really cases of convergence produced by similar conditions of life. Moreover, the ground colors of butterflies are restricted in range to reds, shades of brown, yellow, white, and more rarely blue and green. Also the patterns are limited; nature has repeated them over and over again. It is no wonder that there should be apparent cases of mimicry, in regions so similar as the hot and damp forest-covered plains of Brazil or the upland hot plains of southern Africa and the deep forests of the East Indies. On the other hand, Poulton heads the defenders of the theory and in many ways makes out a most excellent case.

As authorities differ so greatly in their interpretations of the facts, the subject may be considered an open one. That the bad-tasting butterflies are not eaten by birds any more than hairy and bad-tasting caterpillars, is an acknowledged fact; that the edible species mimicking and flying with them are in very rare cases devoured by birds, may be allowed, but its importance as a factor in evolution has been in some quarters unduly magnified. For other cases of mimicry, see PIGMENT; PROTECTIVE COLORATION AND RESEMBLANCE.

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MIMIR, mē′mĭr. A water giant of Norse mythology, who dwelt beneath the world ash Yggdrasill and guarded a spring, considered the source of memory and wisdom and called Mimir's well. Odin in his wanderings asked for a drink from the well and was obliged in exchange to give one of his eyes, the moon, which Mimir sank deep in the spring.

MIMNER′MUS (Lat., from Gk. Μίμνερμος) OF COLOPHON (or Smyrna). A Greek elegiac poet, who lived in the latter half of the seventh century B.C. His work *Nanno*, in two books, was so named from a flute player whom he had loved in vain; it is a collection of elegies that were models for later poets in sustained calmness and tender sentimentality as opposed to the political elegiac verse previously in vogue. Mimnermus is credited with having brought the elegy back to its original design of expressing personal grief, and to have been the first to make the elegy (q.v.) an expression of love; his musical temperament found the elegy a fitting medium. For the fragments, consult: Theodor Bergk, *Poetæ Lyrici Græci* (new ed., Leipzig, 1914); W. C. Wright, *A Short History of Greek Literature* (New York, 1907).

MIMOSA, mĭ-mō′sȧ (NL., from Gk. μῖμος, *mimos*, imitator). A genus of Leguminosæ (pea family) comprising about 300 species, trees, shrubs, and herbs, with bipinnate leaves, natives of the warmer and more arid regions of America, Africa, and Asia. In general, the species are called "sensitive plants," on account of their motile leaves, the leaflets of which change position rapidly if touched. The motility of the leaves is thought to be related to protection against excessive loss of water, and is an adjustment to dry regions. This remarkable power enables the plant to reduce its leaf exposure according to the needs. The species of *Mimosa* belonging to the United States are chiefly natives of the States bordering upon Mexico. The name is also applied popularly to species of the related genera *Acacia* and *Albizzia*. See SENSITIVE PLANT.

MIMS, FORT. See FORT MIMS, MASSACRE OF.

MI′MUS. The Roman name for the mime (q.v.).

MIN, mēn. An Egyptian deity, the local god

of Panopolis or Akhmim (q.v.) and of Koptos (q.v.). He was the god of agriculture, typifying the generative forces of nature, and annual harvest festivals were held in his honor. He is generally represented as an ithyphallic human figure wearing a headdress of two enormous feathers and holding in his right hand a flail. Behind him is a shrine with trees upon it or near it. His sacred animal was the ram. In later times he was often identified with Ammon-Rê. The Greeks identified him with their god Pan. Consult: Adolf Erman, *Life in Ancient Egypt* (London, 1894); Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); E. A. Wallis Budge, *The Gods of the Egyptians* (London, 1904).

MI'NA, or **MNA** (Lat. *mina*, from Gk. *μνᾶ*, *mna*, measure of weight, sum of money, from Heb. *mâneh*, weight, from *mânâh*, to divide, measure out). A Greek weight and denomination in silver money, equal to 100 drachmas (q.v.), and the sixtieth part of a talent (q.v.). The value varied according to the talent used. The Attic mina was worth about $18. It was used for purposes of account, and was never minted as a coin. See NUMISMATICS, *Ancient Coins—Origin—Classification*, first two paragraphs.

MINA, mē'nȧ, FRANCISCO ESPOZ Y (1781–1836). A Spanish guerrillero and general, born at Idocín (Navarra), uncle of Francisco Javier Mina (q.v.), and a member of the class of yeomen. As such, and because of his democratic and radical principles, he disliked the hidalgos, but he was brave and honest, and conducted his warlike operations in as humane a manner as possible. When his nephew was captured by the French in 1810 Mina took his place as leader of a band of guerrilleros and shortly afterward he was appointed by the Junta de Aragón to the command of all the guerrilleros of Navarra. His first act was to shoot a man who was pretending to be a patriotic guerrillero but was only a bandit. The next year the government at Cadiz recognized him and in 1812 he was made commander in chief in upper Aragon. His position here made it possible for him to confiscate large quantities of war supplies that were imported by the French authorities and to levy duty on all other materials imported. With this money he paid his troops regular wages and avoided levying heavy contributions on the country, while he maintained an excellent morale among his men. In the campaigns of 1813–14 he did good service under the Duke of Wellington and was frequently wounded. Having fallen from favor when Ferdinand VII was restored, he made an unsuccessful attempt at a liberal uprising and went into exile. In 1820 he returned and served the Liberal party throughout northern Spain, offering the only serious resistance to the French, who intervened in Ferdinand's favor. In 1823 the French forced him to capitulate and allowed him to escape. Despite his having made in 1830 another attempt against Ferdinand, when the latter died Cristina recalled Mina to Spain and gave him command against the Carlists in 1835. His health was already broken, however, and he died in December of the next year, after forcing the Regent in August to grant a constitution to the country. Consult his *Memorias*, published by his widow (Madrid, 1851–52).

MINA, FRANCISCO JAVIER (1789–1817). A Spanish soldier. He was born at Idocín, in Navarra, took part with his uncle, Francisco Espoz y Mina, in the guerrilla warfare of 1808–09 against the French, but was taken prisoner in 1810 and detained four years at Vincennes. In 1814 he was in arms against Ferdinand VII, but was forced to flee to France. Thence he went to England, where he interested himself in the cause of the Mexican patriots, and with the aid of some prominent Englishmen organized an expedition and sailed for America. In the United States he received sympathy and substantial support, and took 200 volunteers with him, arriving at Galveston in November, 1816. Soon afterward, crossing over to New Orleans, he obtained more assistance, and after being reënforced by 100 Americans at Galveston, landed at Soto Marina, Province of Tamaulipas, April, 1817. At the head of 300 men he defeated Generals Armiñán and Ordóñez, and took the towns of León and Guanajuato with the fortress of Sombrero. Deserted by most of his followers, he was surprised on October 17 by an overwhelming force, taken to Mexico and shot, Nov. 11, 1817.

MINA BIRD. See MYNA.

MINÆ'ANS. A Yemenite people who played an important part in the early history of Arabia. The native name was *Ma'in;* hence the Greek Μεναῖοι or Μιναῖοι. It is possible that the name was originally *Ma'ān*, which has been identified by some scholars with *Magān*, a country southeast of Babylonia, referred to as early as the inscriptions of Naram Sin of Agade in the fourth millennium B.C. and Gudea of Lagash c.3000 B.C. But the identification is doubtful. There is good reason for supposing that the Minæans are mentioned in Judg. x. 12; in 1 Chron. iv. 41, in connection with the Amalekites against whom the tribe of Simeon made a raid in the time of Hezekiah; in 2 Chron. xxvi. 7, in connection with Philistines and Arabs in the days of Uzziah; and in Job ii. 11, where the Greek rendering suggests that Zophar was a Minæan. While there are many references in the Assyrian inscriptions to Kedar, Nebayoth, Aribi, and Sheba (q.v.), there is no mention of a kingdom of *Ma'in*. Among classical writers, Eratosthenes (c.275–195 B.C.), Agatharchides (c.120 B.C.), Strabo (died c.24 A.D.), Pliny (23–79 A.D.), the *Periplus Maris Erythræi* (c.100 A.D.), and Ptolemy (second century A.D.), speak of the Minæans as one of many peoples in southwest Arabia, but have no knowledge concerning the earlier history of this nation. The fact that there was an extensive and flourishing Minæan kingdom in Arabia is known only through the native inscriptions. These have been secured chiefly through the personal efforts of Halévy, Doughty, Euting, and Glaser. Many of these inscriptions still remain unpublished. Most of them are very brief and are readily interpreted, but a few of the longer ones present considerable difficulty. As to the period from which these inscriptions come there was practical unanimity among scholars until 1889. It seemed impossible that they could be older than the earliest Sabæan inscriptions (see SABÆANS), and it was supposed that the Minæan and Sabæan kingdoms flourished side by side. Such eminent scholars as D. H. Müller, Mordtmann, Hartmann, Eduard Meyer, and Huart still adhere to this view, granting that some may be as old as the ninth century B.C., but maintaining that the bulk of them were written in the following centuries. They point out that while the

earlier inscriptions of the Sabæan officials known as *mukarrib* are written boustrophedon, there is no Minæan inscription thus running both ways; that in the famous inscription, Halévy 535, there seems to be a reference to the Medes which would place it in the sixth century; that Eratosthenes apparently knows of Minæan kings reigning at Karna, and that the name Ptolemy occurs in a Minæan inscription on an Egyptian sarcophagus. Glaser, however, in 1889, presented strong reasons for believing that the Minæan kingdom preceded the Sabæan; and Hommel, Winckler, Schmidt, Derenbourg, Margoliouth, Weber, Grimme, and Caetani have advanced arguments in favor of his position. The silence of the Sabæan inscriptions concerning a Minæan kingdom would be very strange, if these nations were for a long time powerful rivals; and the casual references to Sheba in Minæan inscriptions do not seem to harmonize with the position of this power in the centuries preceding 115 B.C. That the Assyrians make no mention of *Ma'in*, while they are frequently occupied with Sheba, apparently indicates the decline of the former and the rising importance of the latter. In its most flourishing period the Minæan kingdom extended far to the north, as is evident not only from the inscriptions found at El Oela, but also from the mention of the *Ma'inu Muzran* in Halévy 535. So extensive a kingdom with its centre in the South Arabian Jauf, where its great cities Ma'in, Karnawu, and Yathil were, can scarcely have existed side by side with a strong Sabæan kingdom with the neighboring Marib for its capital. A long inscription found at Sirwah, unfortunately not yet published, according to competent testimony, describes the destruction of the Minæan kingdom by a Sabæan makrib about 550 B.C. Sargon's (721–705 B.C.) contemporary Itamar is not yet designated as king. As Müller has clearly proved that the *mukarrib* preceded the kings of Sheba, the inference seems necessary that the Minæan kingdom flourished before the Sabæan mukarrib period and fell before the rise of the Sabæan kingdom. The Minæan system of writing shows in many respects a closer affinity to the earlier than to the later Sabæan script; and the oldest Sabæan inscriptions indicate a long period of development of the South Arabian system of writing. Hence the fact that the earliest Sabæan inscriptions are written boustrophedon does not show that this script has been recently introduced. A comparison of the language clearly manifests the higher age of the Minæan, which has preserved the *s* in the causative and in the pronominal suffixes against the *h* in the Sabæan. The identification of the Madhay as Medes is extremely doubtful; and Grimme's suggestion that it represents the people of Midian seems to possess far more probability. That the Minæans continued to exist as a people long after their power in Arabia had passed to others is evident from the Greek writers. Whether Eratosthenes drew upon older sources accessible to him in Alexandria, was imperfectly informed, or actually knew of petty kings reigning in Karna in his day, no scholar would seriously maintain that the power reflected in the Minæan inscriptions could have been exercised from Karna in the third century B.C. If the sarcophagus inscription is really Minæan rather than Hadramautian and Talmith is Ptolemy, its content shows not more clearly the survival of ancient forms, along with some very late ones, among the Minæans of the period, than the absence of any important Minæan kingdom at that time. It therefore seems exceedingly probable that the 26 kings of *Ma'in* known from the inscriptions reigned before there was any Sabæan king in Marib. As it is scarcely credible that chance should have given us the name of all Minæan kings or that the 26 names represent an unbroken succession, it would be hazardous to infer that the earliest of them cannot have reigned more than four or five centuries before the last. There may have been more than one dynasty. As among the Sabæans, so in the kingdom of *Ma'in* each year seems to have been named after two *mukarrib* or high officials, like the *limmi* in Assyria, the archons in Athens, the ephors in Sparta, or the consuls in Rome. The absolute age of the Minæan kingdom cannot be determined. The early occurrence of numerous place names in southern Syria and northwestern Arabia which seem to have been transferred from Yemen, the raids of Minæans upon Palestine in the period of the Judges, and the essentially Yemenite character of the traditions brought by clans afterward forming a part of the people of Israel, from the land of Midian and the Negeb to Canaan, render it probable that kings of *Ma'in* extended their power to the borders of Palestine as early as the thirteenth century B.C. The Minæans were to a large extent a settled people living in cities, cultivating the soil, worshiping in sanctuaries. Their chief gods were a male deity, Athtar (see ISHTAR), the solar goddess Shamsi, Wadd, and Ankarih. They had priests and priestesses, hierodules and sacred prostitutes, a sacrificial cult, and many rules of taboo. A deeper religious sense is apparent than in the period of skepticism and syncretism preceding Mohammed.

The language of the Minæans is only dialectically different from the Katabanian, Hadramautian, and Sabæan, and is closely akin to the Ethiopic and the classical Arabic. As to the origin of the system of writing used by the South Arabian peoples, it is supposed by Halévy and Lidzbarski to have been formed from the North Semitic alphabet by a modification of certain signs to denote kindred sounds and by changes rendering the signs generally symmetrical. There is indeed good reason to suppose that many new signs were added in Arabia by slight changes in those already existing, and that the characters were given a squarer form. But there are some letters that are so different from those of the North Semitic alphabet as to raise the question whether other extraneous influences may not have been at work. Whatever the relations of the various Egypto-Libyan, Mycenæan, and Anatolian alphabets, the contact of the Minæans with Egypt and the Philistine coast makes it probable that it was in the northwest rather than on the Persian Gulf that this alphabet grew up. A tablet found at Lachish shows that not only cuneiform signs but also the Mycenæan signary was to some extent used in the Philistine cities in the fourteenth century B.C. It may have been from Gaza that the Minæans brought the prototype signs of their alphabet. As our oldest inscriptions in the North Semitic alphabet, dating from the tenth and ninth centuries, show that this system of writing must have been long in use, so our earliest Minæan inscriptions indicate that the South Arabian alphabet already had a long and as yet quite obscure history of development.

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MINAEV, mē-nä′ĕf, DMITRI (1835–89). A Russian poet, born at Simbirsk. He was educated in a military school, and, after brief service as secretary in the Department of the Interior, from which he resigned in 1857, devoted himself to literature. His most important work was as a translator of parts of Dante's *Inferno* and of some of the works of Victor Hugo, and, among English poets, of Shelley, Byron, and Marlowe. His original works include poetry, especially satire, and a comedy, which won a prize from the St. Petersburg Academy.

MIN′AHAS′SAS. The natives of the Province of Minahassa in northern Celebes, called by some authorities Alfuros. A mixture of types certainly exists. Physically, the Minahassas appear to be related to the Tagals and other Philippine tribes, and there is even a suggestion of Japanese features. In point of language they are undoubtedly members of the Malay stock, but differ notably from other divisions of this family in Celebes and again approximate Philippine tribes. Since cultural evidence points in the same direction, the Minahassas may safely be considered alien immigrants from the north. The Malayan language proper has in recent years made considerable inroad upon the native dialects. Among the Minahassas women are on an equal footing with men, although from Mohammedan influences some modifications have been made upon the ancient monogamy of this people. The best account of the Minahassas in English is in Hickson, *A Naturalist in North Celebes* (London, 1889). See ALFURESE; CELEBES; MOLUCCAS.

MINAMOTO YORITOMO, mē′nä-mō′tō yō′rē-tō′mō (1146–99). A Japanese warrior and statesman who played an important part in the struggles for power of the rival military families, the Taira and the Minamoto, to the latter of which he belonged. His father, Yoshitomo, having been treacherously murdered in 1159 at the instance of Kiyomori, chief of the Taira clan and at that time the virtual ruler of the country, Yoritomo fled, but was captured and condemned by Kiyomori to be beheaded. Spared through the pity of the stepmother of Kiyomori, he was banished to Idzu. There he married the daughter of Hojo Tokimasa, one of his guardians in exile. In 1180, calling around him his father's scattered retainers, and securing the assistance of his father-in-law and the monks of Hiyeizan (see KYOTO), he got together an army which he placed under the command of his youngest brother, Yoshitsune, and proceeded against the Taira. Five years later his enemies were utterly annihilated in a great naval battle off Dan-no-ura, near Shimonoseki. He made Kamakura his capital, was created Sei-i-tai-shogun in 1192, laid the foundations of the feudal system in Japan, and became the virtual ruler of the land—nominally under the Mikado—and the office of shogun became hereditary in the Minamoto family. He died in 1199 with his great reputation somewhat sullied by his cruel treatment of his brother Yoshitsune. See MINAMOTO YOSHITSUNE.

MINAMOTO YOSHITSUNE, mē′nä-mō′tō yō′shē-tsōō′nā (1158–1189). A Japanese chieftain. Japanese history in the eleventh and twelfth centuries A.D. is concerned with the struggles of the Taira and the Minamoto clans. In 1159 Yoshitomo, the head of the Minamoto, was killed and his clan defeated. His three sons escaped, and after years of adventure defeated the Taira finally in 1185. Yoshitsune, the youngest of the three, was the lieutenant of his elder brother Yoritomo, and the most efficient warrior in his army. Yoshitsune was in command when the last battle was fought, but his success excited the jealousy of his brother, who sought his death. Escaping with 11 comrades, Yoshitsune was pursued and committed suicide in 1189. His history, with its adventures, triumphs, and tragic end, is the favorite theme of romance, poetry, and drama. In one form of the story the hero escaped with his life and found refuge among the Aino in Yezo, where he is still worshiped as a god. Another legend represents him as going to the continent of Asia and identifies him with Genghis Khan.

MIN′ARET. The tower of a mosque (q.v.). The Mohammedan call to prayer is chanted by the voice of the muezzin, who, five times daily, mounts to its upper balcony to summon the faithful with the prescribed formula. Each mosque has one or more minarets. The normal number for the largest Djami mosques is four, one at each angle of the edifice. Some have as many as six, e.g., the Ahmed mosque at Constantinople. The mosque at Mecca has the exceptional number of seven.

The usual type is a square, polygonal, or cylindrical structure of stone or brick, consisting of several stories marked by balconies, either projecting on stalactite supports or with a receding story above; it is crowned by a pinnacle or small dome. The summit is reached by a winding inner stairway; only the old stone minaret of Tulun at Cairo has an external winding staircase.

The earliest mosques had no minarets. They were first built during the seventh century, the Caliph Omar being said to have erected two, at

Kufa and Medina. Those earlier than the twelfth century were usually heavy square structures of stuccoed brick or stone without much ornament. This type is preserved at the mosque of Sidi Okba at Kairwan in Tunis. This square type persists in north Africa outside of Egypt, and was carried by the Moors into Spain. The Giralda at Seville (q.v.) is one of the largest and richest of this type, though the upper stages are a Renaissance addition. The minarets of Cairo are usually polygonal and highly ornate, with corbeled balconies and receding stages. Among the finest are those of Ibn Tulun, Hassan, Barkuk, Kalaun, Bordeni, and Kaït Bey. The Hassan mosque has two minarets; that of Kaït Bey only one.

The minarets of Egypt, Spain, Syria, India, Persia, and Turkey built between the thirteenth and sixteenth centuries are among the most original and graceful works of Eastern architecture. The Turkish type is the simplest—a cylindrical or fluted shaft with one to three corbeled balconies and a slender conical spire terminating in a gilded crescent. The Persian minarets are also cylindrical, with bulbous tops, and are veneered with brilliant ceramic tiles. Those of India show varied forms, some following Hindu models, others the Persian, but executed in marble or sandstone without tiles, as at Delhi and Agra. The most remarkable is the most ancient—the Kutub Minar at old Delhi (c.1200), a superb tower in four tapering and receding stories, each of a different star-shaped or scalloped plan. Damascus and Bagdad preserve some of their mediæval examples. The minarets of the Constantinople mosques, such as St. Sophia, Ahmed, etc., are exceedingly graceful. Sometimes the colleges, or madrasah, had minarets of style similar to those of the mosques, as in that of Sultan Husein at Ispahan, where the towers are similar to those of the great mosque of Ispahan. The height varies greatly; among the highest are the Giralda (formerly 230 feet, now 308 feet) at Seville, Kalaun (193 feet) and Hassan (280 feet) at Cairo, and the Kutub Minar, near Delhi (242 feet). See MOSQUE; and consult the bibliography of MOHAMMEDAN ART.

MINAS, mē′nâsh, more properly BELLO HORIZONTE, bĕl′lô ō′rē-zōn′tă. The capital of the State of Minas Geraes, Brazil (Map: Brazil, J 8). It stands on a plateau, at an altitude of 3017 feet, 60 miles northwest of Ouro Preto (q.v.), whence the capital was removed in 1897. It was founded, in 1894, upon modern plans, with wide, well-paved streets and large public gardens. Its public buildings include the post office, Law School, President's palace, Library of Congress, public market, and two theatres. It has also many fine residences. It is lighted by electricity and has an excellent supply of pure spring water. It has made a beginning of industrial life by the establishment of a few factories. Pop., 1912 (est.), 35,000.

MINAS, mē′nâs. Capital of the department of the same name in Uruguay. It is picturesquely situated 55 miles northeast of Montevideo, with which it is connected by rail (Map: Uruguay, J 4). It is surrounded by well-cultivated grain-producing lands, and there are quarries of marble and granite in the neighborhood. Pop. (municipality), 1900, 8955. The city was founded in 1784.

MINAS DE RIO TINTO, mē′nâs dâ rē′ō tēn′to. An important mining town in southern Spain, in the Province of Huelva, situated among the mountains, 32 miles northeast of the city of Huelva (Map: Spain, B 4). The surrounding country contains almost inexhaustible deposits of copper ore, which were exploited by the ancient Phœnicians. In 1873 the mines were taken over by a London company and the methods of obtaining the ore revolutionized. The mines now employ 10,000 workers; in 1911 the quantity of ore produced amounted to 1,603,854 tons. The town, which in 1845 had a population of only 800, numbered, in 1900, 9956, and, in 1910, 12,626.

MINAS GERAES, mē′nâsh zhâ-rīsh′. A southeastern state of Brazil, bounded by Bahía on the north, Bahía, Espirito Santo, and Rio de Janeiro on the east, Rio de Janeiro and São Paulo on the south, and São Paulo, Matto Grosso, and Goyaz on the west (Map: Brazil, H 7). It is the fifth state of Brazil in size, having an area of 221,951 square miles. It lies wholly in the Brazilian plateau, with an average elevation of 2000 feet, and is traversed by a number of mountain ranges, which, although the highest in Brazil, are not very prominent, owing to the general elevation of the surrounding country. The principal ranges are the Serra da Mantiqueira, along the southern frontier, and the Serra do Espinhaço, running north and south through the centre of the state. At their junction is Mount Itatiaia, about 9000 feet high and the highest point in Brazil. Only the mountain ranges and the river valleys are forested; between them are extensive steppes covered only with grass and scanty shrubbery. Minas Geraes is watered by numerous rivers, including the São Francisco (with its numerous tributaries which take in the larger portion of the state), the head streams of the Paraná, the Doce, and the Jequitinhonha. All the rivers have numerous cataracts and rapids; only the São Francisco is navigable for any distance, and it has no direct connection with the Atlantic Ocean. The climate, in general, is temperate, averaging 71.6° F. for the whole state. A great portion of the south and centre enjoys a much cooler climate, while the thickly wooded river valleys are very hot and humid. Originally the chief economic interest was centred in gold and diamond mines. These industries, in decline for a long period, have been revived and also the exploitation of mines of iron, of which there are large deposits, manganese, and precious stones has been undertaken. The chief industries are agriculture and stock raising, the leading agricultural products being coffee, corn, beans, rice, potatoes, tobacco, cotton, and sugar cane. Stock raising is carried on extensively, and butter and cheese are produced in large quantities. The chief manufactures are those of cotton, textiles, and cigars. The railway lines traversing the southern part of the state have a mileage of 2700 miles. Minas Geraes had a population of 3,184,099 in 1890, 3,594,471 in 1900; 4,500,000 (est.) in 1911. The inhabitants are largely of mixed origin, and the number of aborigines is still considerable; negroes are also numerous. Minas Geraes was settled at the end of the sixteenth century, immigrants being attracted there by the gold and diamond deposits. It was separated from the Captaincy General of Rio de Janeiro in 1709 and was made an independent captaincy in 1720. In 1788 it was the scene of an unsuccessful insurrection led by Joaquim José da Silva Xavier, "Tiradentes," which had

for its object independence and the establishment of a republic. Other revolts against the central government occurred in 1833, 1842, and 1844, all of which were suppressed. The capital was Ouro Preto (q.v.), up to 1897, when the seat of government was removed to Bello Horizonte or Minas (q.v.).

MINBU, mĭn′bōō. A district of the division of Magwe, Burma. Tillage and fishing are the chief industries. Area, 3302 square miles; pop., 1911, 263,939. Capital, Minbu.

MINCH. An arm of the Atlantic Ocean which separates the island of Lewes in the Hebrides from the northwest of Scotland (Map: Scotland, C 1). Its shores are exceedingly irregular and its average width is about 30 miles. It connects with the Gulf of the Hebrides to the south by the Little Minch, which is about 15 miles wide, and which separates the Isle of Skye from that of North Uist and the neighboring islands in the outer Hebrides.

MINCIO, mēn′chō. A left affluent of the River Po, Italy, which it joins near Governalo, 10 miles southeast of Mantua, after a southeasterly course of about 120 miles. Its source is at Pescheria, where it flows from Lake Garda. It is the ancient Mincius, and during the Austro-Italian wars (1800–14) was an important strategical base, several battles being fought along its banks.

MIN′CIUS. The ancient name for the river MINCIO. This stream is celebrated by Vergil in his *Eclogues.*

MINCKWITZ, mĭnk′vĭts, JOHANNES (1812–85). A German poet and classical scholar, born at Lückersdorf. He was educated at Leipzig, was appointed professor there in 1861, and in 1883 removed to Heidelberg. He first gained fame by his translations into German of Homer, Æschylus, Sophocles, Euripides, Aristophanes, Pindar, and Lucian. He also wrote *Vorschule zum Homer* (1863). In the field of German criticism Minckwitz wrote *Platen als Mensch und Dichter* (1836) and *Leben Platens* (1838), and edited Platen's (q.v.) posthumous papers (1852); and he also published: *Lehrbuch der deutschen Verskunst* (1844); a play, *Der Prinzenraub* (1839); and a volume of popular poems (1847). Consult *Briefwechsel zwischen Platen und Minckwitz* (Leipzig, 1836).

MINCOPIES, mĭn′kō-pĭz. The native inhabitants of the Andaman Islands. They are in general of very low stature, averaging 1.49 meters, and are subbrachycephalic with an index of 82.6. They have a very low grade of civilization, living in huts called chongs, which consist merely of a roof on four stakes, and going naked. They live by hunting and use a peculiar bow in the shape of an S, which presents a curious analogue to certain Eskimo bows and also to the bows of some Bantu tribes in East Africa. Linguistically it has been impossible to connect them with any other group, even among peoples of similar physical type. Consult: Man, "Aborigines of the Andaman Islands," in the *Journal of the Anthropological Institute,* vol. xi (London, 1882); Deniker, *Races of Man* (ib., 1901); A. R. Brown, "Notes on the Languages of the Andaman Islands," *Anthropos* (Salzburg, 1914). See ANDAMANS.

MIND (AS. *gemynd,* Icel. *minni,* Goth. *gamunds,* memory, from AS. *munan,* Icel. *muna,* Goth. *gamunan,* to remember; ultimately connected with Lat. *mens,* Gk. *μένος, menos,* mind, Skt. *man,* to think). The collective term for the subject matter of psychology (q.v.). The common-sense view of mind makes it a mind substance, a spiritual agent, a real, simple, and unitary being, sharply opposed to material substance as "thought" is opposed to "extension," yet interacting with the physical universe under some form of the causal law. This conception of mind has its root in primitive reflection upon the phenomena of sleep, dreams, trance, and death, and upon certain types of behavior, especially, we may suppose, upon the behavior which expresses emotion. It received philosophical treatment at the hands of the scholastic psychologists, and, in its current form, is practically a legacy from Descartes. It is doubtless kept alive by its emotional value; it satisfies human aspirations and accords well with the natural anthropocentric notion of the world at large. It is still held by some psychologists: Ladd openly accepts it, and James, while rejecting it for his psychology, yet admits that, for his personal thinking, it appears "the line of least logical resistance." Nevertheless, such a view of mind is wholly foreign to the spirit and to the requirements of modern psychology. In the first place, it is unsupported by psychological evidence. Had there been the same emotional temptation to reject minds as there has been to posit them, we may be sure that the arguments ordinarily urged in their favor would have received but scant attention. Secondly, the assumption of a real mind is superfluous. "The substantialist view of the soul," says James, "is at all events needless for expressing the actual subjective phenomena of consciousness as they appear"; "the substantial soul explains nothing and guarantees nothing."

Numerous difficulties have been encountered, upon the metaphysical side, in the attempt to resolve the dualism of mind and body which is involved in this concept of the substantial mind. (See SUBSTANCE; SOUL; DUALISM; MONISM.) In consequence there arose, early in the history of psychology, a second view, according to which mind is not substance but active principle; mind is an activity. Aristotle, who first developed the theory, identified mind with the principle of life; mind is the regulative or formative principle of the biological process, and its relation to body is similar to that of form to matter. This view was also that of the neo-Scholastics (see AQUINAS, THOMAS); and, stripped of biological implications, it furnishes the initial basis of certain definitions of mind which may be found in present-day psychology. It is important, for the understanding of the theory, to distinguish between mind as an activity and the activity of mind. The substantial mind was early thought to be an active mind; feeling, perception, memory, imagination, etc., were all activities of the mind, and it was only through these activities that mind could be known. Furthermore, the attempt to subsume these activities under one or more principal activities or functions gave rise to what is called faculty psychology. (See FACULTY.) Aristotle's faculties, on the other hand, were not powers or activities of a mind; they were rather stages in the growth or development of mind; feeling is mind at a lower stage, thinking is mind at a higher stage. A third conception of mind became possible only when metaphysical discussion and logical classification gave way to scientific observation and description. Mind then came to be regarded (1) as

a form of experience or (2) as an aspect of experience. Those who adopt the first view characterize mental experience as that mode of experience which is directed towards an object; e.g., in idea something is ideated, in judgment something judged; and the mental phenomenon, therefore, is the *ideating* or the *judging*. But these are again mental acts; and so we find a return to the "activity" theory of Aristotle, with the difference that the act of seeing, hearing, judging, etc., is now held to be a form of direct experience. Those who adopt the second view deny that the phenomena of mind are a peculiar form of experience; they believe, on the contrary, that mind has to do with the whole world of experience, but only in so far as it is dependent upon an experiencing person. Even here, however, there are differences of opinion. If the experiencing person, otherwise undefined, is conceived as standing in some sort of relation to an object, then it is possible to reach a functional view of mind which in many respects is similar to the "activity" theory. But if the experiencing person is further defined as a physiological individual; if mental experience is regarded as that aspect of experience which is conditioned upon a nervous system, then the sights, the sounds, the warmths, the pains, etc., which we experience are themselves so many items of mind.

In so far, then, as the older theories of mind are concerned, modern psychology is what Lange, the historian of materialism, named it—a psychology without a mind, a *Psychologie ohne Seele*. Even the few writers who still cling to the substantialist view make no use of the assumption in their actual presentation of psychological facts and laws; it is only in their concluding remarks, at the point of transition from psychology proper to metaphysics, that mind, the "unit being," is introduced. At the same time it would be entirely erroneous to apply Lange's phrase, without qualification, to mental science. A psychology without some sort of mind would be impossible. The new psychology keeps the term "mind," but defines it, in functional or existential terms, as the sum total of an individual's mental experience. Just as a plant is a closed group of physiological functions, so is mind the collective name for the closed group of mental functions; or, just as the plant, again, is the organized whole of root, stem, leaves, and flowers, and not something above and behind these parts, so is mind the organized whole of our mental processes (q.v.), and not something above and behind these manifestations of mentality.

Bibliography. Brentano, *Psychologie vom empirischen Standpunkte* (Leipzig, 1874); William James, *Principles of Psychology*, vol. i (New York, 1890); G. T. Ladd, *Philosophy of Mind* (ib., 1895); Oswald Külpe, *Introduction to Philosophy* (ib., 1897); Ebbinghaus, *Grundzüge der Psychologie*, vol. i (Leipzig, 1905); Wilhelm Wundt, *Outlines of Psychology*, translated by C. H. Judd (3d ed., New York, 1907); Oswald Külpe, *Outlines of Psychology* (ib., 1909); E. B. Titchener, *Text-Book of Psychology* (ib., 1910); Ladd and Woodworth, *Elements of Physiological Psychology* (ib., 1911); G. F. Stout, *Manual of Psychology* (London, 1913); O. Klemm, *History of Psychology* (New York, 1914); Maher, *Psychology* (ib., 1903). See BODY AND MIND; CONSCIOUSNESS; ELEMENTS, CONSCIOUS.

MINDANAO, mên'dä-nä'ō. One of the most important and, according to the latest official estimate, the second in size of the Philippine Islands. It is the southernmost of the large islands of the archipelago, between lat. 5° 21′ and 9° 50′ N. and between long. 121° 53′ and 126° 28′ E., about 220 miles northeast of Borneo and 270 miles north of Celebes (Map: Philippine Islands, D 7). It is bounded on the north by the channels and seas separating it from the islands of Leyte, Bohol, Cebú, and Negros, the narrowest of these channels being the Strait of Surigao, 7 miles wide, separating the northeast extremity of the island from Leyte. On the east Mindanao is bounded by the Pacific Ocean, on the south by the Celebes Sea, and on the west by the Sulu Sea.

Area and Configuration. The latest official estimate gives as the area of the mainland, 36,292 square miles, or 4677 square miles less than Luzon, and of the 264 dependent islands, 1165 square miles, making a total of 37,457, which, even excluding the dependent islands, is larger than that of the State of Indiana. Mindanao, like Luzon, is very irregular in outline, having a shore line of nearly 1600 miles in length. It consists of a main body about 300 miles long from north to south and 150 miles broad, with a long irregular peninsula stretching in a semicircle for 180 miles from the centre of the west coast, where it is connected by an isthmus between the Bay of Iligan on the north and the Bay of Illana on the south. There are numerous other large and small bays on all sides of the island, among which the large and deep Bay of Dávao indenting the south coast is one of the finest and largest of the archipelago. Of the dependent islands the principal (with their areas in square miles) are the following: Camiguín (94), off the north coast; Dinágat (309) and Siargao (151), on the northeast; Sámal (147), in the Bay of Dávao; Balut (42) and Sarangani (25), to the southeast; Olutanga (36), south of the western peninsula; and Basilan (478), forming with about 50 small islets a separate province at the extreme southwestern end.

Topography. The coasts as a rule consist of sandy beaches interrupted by numerous rocky headlands. Almost everywhere the forest-covered mountains approach close to the shores, and the interior is in general very mountainous, containing the highest peaks in the Philippines, such as Mount Malindang, 8560 feet high, in the northwestern part, and the volcano of Apo, 10,312 feet, west of Dávao Bay. The mountain system consists of a number of irregular, broken, and roughly parallel chains traversing the island from north to south and inclosing between them large and fertile valleys. The configuration of the mountains in many places bears evidence of having been influenced and even originated by volcanic action. There are several active and a number of extinct volcanoes, while plains of volcanic matter as well as sulphur and hot springs occur, and the island is subject to frequent and violent earthquakes. During the severe earthquake which visited the islands during 1897 the town of Zamboanga was ruined by the shaking and by a great sea wave. Very little is known concerning the geology of Mindanao. Like southern Luzon, volcanic rocks of modern date cover the island.

Hydrography. The two principal river systems lie on either side of the central mountain

range, both of them running almost the entire length of the island. On the east is the Augsan, over 200 miles long, running northward into the Bay of Butúan; on the west is the Río Grande de Mindoro, over 200 miles long and the second river in size on the archipelago, running south, then west into the Bay of Illana, and rivaling in size the Cagayán of Luzon. Both of these systems include several large lakes. Owing to the proximity of the mountains to the coasts most of the remaining rivers of Mindanao are short and torrential.

Climate. Being situated at the southern end of the archipelago, within 10 degrees of the equator, and being less exposed to cooling winds than the northern islands, Mindanao has a hot and humid climate. The warm and moisture-laden south winds are particularly enervating, though the land breezes from the mountains are cool and refreshing. The climate is more equable than that of Luzon and consequently less invigorating, and the island is seldom touched by the typhoons, which rage only among the northern islands. The rainfall is very heavy, often exceeding 100 inches and reaching sometimes 140 inches in a year. Several parts of the island are subject to destructive inundations.

Flora and Fauna (for general description see PHILIPPINES). The vegetation of Mindanao, even compared with the rest of the archipelago, is remarkably luxuriant. Almost the whole island is covered with forests so interwoven with canes and vines as to form in many places an impenetrable jungle. The flora partakes of the character of that of Celebes and the Moluccas; cinnamon, nutmeg, and other spices, and betel nuts grow wild, and the forests abound in the most valuable building timber and cabinet woods. The animal life is equally abundant and varied, including, besides the species common to all the islands, many species peculiar to Mindanao. Monkeys are very numerous, and especially characteristic is the white monkey (*Macacus philippinensis*). Reptiles, including venomous snakes, abound, and the rivers are infested with crocodiles.

The population as shown by the last census, 1903, was 499,634, an average of 14 per square mile. Of this population 252,940, or over one-half, were classed as "wild" or noncivilized. About one-third of the total are Christianized Malays, about one-half of the total are Moros (Mohammedan Malays), the remainder Chinese, "mestizos," and uncivilized tribes.

Agriculture and commerce have received little attention, although the agricultural possibilities are very great. Rice, sugar, coffee, hemp, corn, tobacco, and the betel nut are grown, and the quality and quantity both suggest great possibilities if properly managed. At present less than 2 per cent of the island is under cultivation, but there seems no reason why the island should not produce great quantities of sugar, hemp, rice, and copra. Cinnamon, nutmegs, and spices are found in the forests and would probably justify cultivation and care. The natives take no interest in agriculture in excess of that needed to meet their personal requirements. The forests produce valuable woods, but little has been done to find markets for them.

Consult: Julian González Parrado, *Memoria acerca de Mindanao* (Manila, 1893); José Nieto Aguilar, *Mindanao, su historia y geografía* (Madrid, 1894); W. E. Retana y Gamboa, *Bibliografía de Mindanao* (ib., 1894); Francisco Combés, *Historia de Mindanao y Joló* (ib., 1897). See PHILIPPINE ISLANDS.

MIND AND BODY. See BODY AND MIND.

MIND CURE. See FAITH CURE; HYPNOTISM; MENTAL SCIENCE; MESMERISM; PSYCHOTHERAPEUTICS; SUGGESTION.

MIN'DEN. An ancient town in the Province of Westphalia, Prussia, on the left bank of the navigable Weser, 39 miles west of Hanover (Map: Prussia, C 2). It is an old-fashioned town, with narrow, winding streets, but the suburbs are modern. Its fortifications were demolished in 1873. Its public buildings include the thirteenth-century cathedral, a fine early Gothic structure with valuable works of art in its treasury; the town hall, the church of St. Martin, the government buildings, and the Gymnasium. Minden manufactures linen and cotton goods, dyestuffs, cigars, glassware, chemicals, chocolate, leather, lamps, cement, paper, chicory, and iron products. It also builds ships and repairs railway rolling stock. Charlemagne made Minden the seat of a bishopric, which was converted into a secular principality in 1648 and united with Brandenburg. Near Minden an Anglo-Prussian force under Ferdinand of Brunswick defeated a French army under Contades, Aug. 1, 1759. See SEVEN YEARS' WAR. Pop., 1900, 24,327; 1910, 26,454, chiefly Protestants.

MINDEN. A town and the parish seat of Webster Parish, La., 30 miles east-northeast of Shreveport, on the Louisiana and Arkansas Railroad (Map: Louisiana, C 1). Cotton, corn, sugar, and potatoes are raised extensively, and the chief industrial establishments are saw mills, cottonseed-oil mills, and compresses. The water works are owned by the town. Noteworthy attractions include the three parks and the splendid high-school building. Pop., 1900, 1561; 1910, 3002.

MINDONGA. See CHOBI.

MINDORO, mēn-dō'rō. One of the Philippine Islands, among which it ranks seventh in size. It is situated south of the main body of Luzon, from which it is separated by a sea channel 7½ miles wide (Map: Philippine Islands, C 4). Its extreme length from northwest to southeast is 100 miles, and its greatest width is 58 miles. The area of the mainland is 3851 and of the 26 dependent islands 173 square miles, making a total of 4024 square miles. The island has an oval shape with no large indentations, though there are a number of small bays and several almost landlocked harbors. The coasts, though generally having deep water close to shore, are lined, especially along the west side, with submarine reefs. Mindoro is, next to Mindanao, the most elevated of the Philippine Islands. The whole interior forms a mountainous plateau, reaching in Mount Halcón the height of 8800 feet. Almost the whole of the island, from the mountain summits to high-water mark, is covered with unbroken virgin forests, though in the narrow strip of lowland along the western coast there are some prairie and marshy regions. The rivers are all short and simple streams running down from the edge of the plateau on all sides, there being no large river system. The climate is more variable than that prevailing in the southern islands, and Mindoro is especially exposed to typhoons. The proximity of the forests to the coast towns renders these unhealthful and subject to intermittent and typhoid fevers. The yield of rice was at one time so great that the

island was called the "granary of the Philippines," but the industry was destroyed by Moro pirates.

In spite of the fertility and natural wealth of the island its economic conditions are in a very backward state. A very small portion of it is cultivated, and the yield of agricultural products is scarcely enough for home consumption. The cultivation of sugar, cotton, and hemp is increasing, and a little of the latter is exported. The mineral wealth is believed to be considerable, but only the coal beds and sulphur springs have begun to be exploited. The principal exports are forest products, such as timber and pitch, and the forests also are the basis of the principal industries—woodcutting and rattan splitting. Communication is almost exclusively carried on in coasting vessels, the interior being a rough and pathless wilderness.

The population of Mindoro in 1903 was 28,361, including 7264 savages. The inhabitants are chiefly Tagalogs, who number 18,185, with 7266 Mangyans, 2088 Visayans, and 630 Ilocanos. The inland of Mindoro, together with its dependent islands, forms the Province of Mindoro, which had in 1903 a population of 39,582. The most important tribes were represented as follows: Tagalogs, 26,408; Mangyans, 7268; Visayans, 4962. See PHILIPPINE ISLANDS.

MIND READING. See MUSCLE READING; TELEPATHY.

MIND-STUFF THEORY. A metaphysical theory which explains the relation of matter and mind by affirming their identity under the form of atoms of mind stuff. These atoms are of a nature between physical atoms and psychical monads, representing an indivisible element, as the former, but being qualitatively rather than quantitatively determined, as the latter. Mind and matter, according to this theory, are but forms of composition of the atoms of mind stuff; only under the most rarely favorable conditions does this composition result in intelligence, as in the higher animals, but at the same time no matter is to be conceived as "dead" matter, since it is built up of elements whose essential character is psychical. Mind stuff seen from the inside constitutes what we call mind; seen from the outside it is what is called matter. The theory is expounded by W. K. Clifford in *Mind*, o. s., vol. iii.

MINE. See MINING.

MINE, SUBMARINE. Formerly all explosive devices designed to destroy or injure a ship by blowing a hole in her hull below the water line were called torpedoes. They were divided into two classes, fixed and moving. The fixed class are now called *submarine mines*. Reference should be made to article TORPEDO for the history of submarine mines. Submarine mines are (1) self-acting and (2) controlled, according to the conditions of firing. Self-acting or contact mines are mechanically or electrically fired. The mechanical arrangements are of numerous types, but the most common have pins or levers which are on the exterior of the case. When struck by a passing vessel the pressure, or a spring released by the lever, drives a firing pin against a fulminate primer in contact with the charge. The electrically fired are (1) simple buoyant mines anchored, like all buoyant mines, so as to be held 5 to 20 feet below the surface, and (2) combination ground mines with a buoyant contact held at a similar depth. In both these types the explosion is caused by the completion of the circuit by driving in a pin, depressing a lever, or the operation of some other device, when the mine or contact piece is struck by a ship. Electrically fired mines usually have separate battery boxes connected by a long double conductor wire to the mine. The battery box is thrown over when the mine is launched and lies on the bottom near the anchor.

Controlled mines are (1) automatic and (2) observation. The firing wires for all controlled mines lead to mine stations. For automatic mines this is done to secure safety. When the circuit is broken at the station the channel is safe for the passage of ships, but when it is closed the mine will explode if struck. The combination controlled mine, like the combination self-acting, is a ground mine with a buoyant contact piece; it is made ready in the same manner as an automatic controlled mine. Observation mines are fired by the observers. These are placed in stations so located that their lines of sight at the mine field intersect at angles of 45° or more. Each group of mines has a corresponding contact that is passed over by the sight bar on each observer's switchboard when the sight is directed to the centre of the group. When both contacts of a group are made the mines of the group are fired; this will of course occur when a ship is directly over the group. Observation mines may be of the simple or compound buoyant type or of the ground type. The simple buoyant mine can be exploded only by the observers; the compound type has pins and levers for explosion by contact so that it may be considered as belonging also to the *automatic* buoyant controlled type. Observation ground mines are simple if fitted for explosion by the observers only, and are combination if they also have contact pieces. Drifting mines are always self-acting, and most of them are mechanically fired.

In the accompanying figures many minor details are omitted for the sake of clearness.

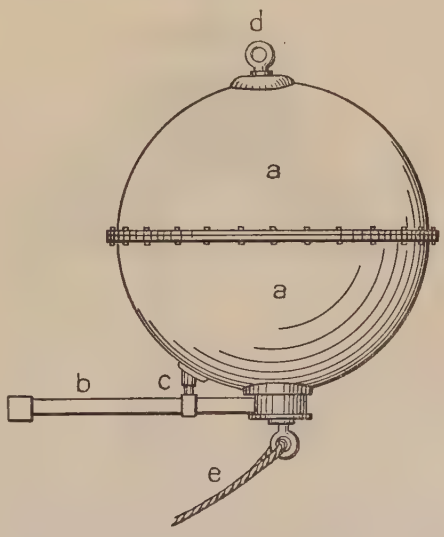


FIG. 1.

Figure 1 is a self-acting, mechanically fired mine, operated by the lever *b*; *a*, *a*, are the halves of the mine case; *c*, a detent which holds

the lever in position until struck; *d*, the transporting lug; *e*, the anchor rope. A similar mine, fitted with an electric primer and switch in place of the percussion primer and firing pin, and with electric wires connecting it to an observing station, would be an automatic controlled mine; if fitted with wires and a battery instead of connected to a station it would be a self-acting, electrically fired mine. *Observation* mines have a similar appearance except as regards the lever, which is omitted. Figure 2

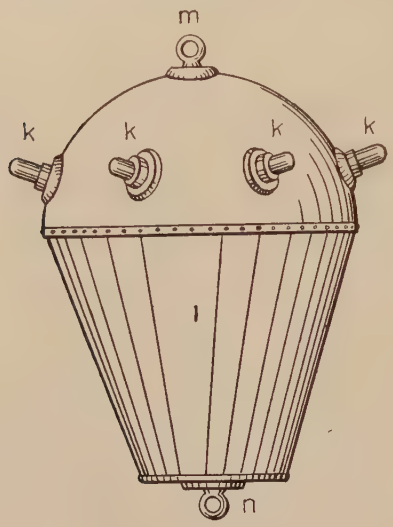


Fig. 2.

is a self-acting, mechanically fired mine, operated by the driving in of one of the pins *k; l* is the shell or mine case; *m*, the transporting lug; *n*, lug for the anchor rope; *k*, *k*, *k*, *k*, firing pins. Figure 3 is one of the many types

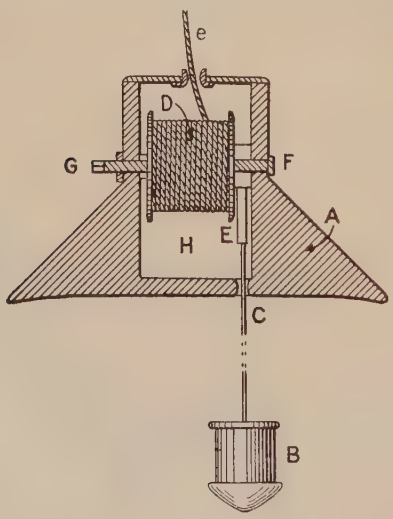


Fig. 3.

of mine anchors; *A* is the cast-iron body; *B*, the distance weight; *C*, the distance rope; *D*, the reel carrying the anchor rope *e; E*, pawl to control the operation of the reel *D; F*, reel axle; *G*, square head of reel axle to take wrench for reeling in. Figure 4 shows the operation of anchoring. The depth of water is assumed to be about 40 feet; the mine to be held at 10 feet below the surface. *a*, *b*, *c*, show the position of the mine in the three stages of the process. *A* is the anchor; *B*, the distance weight; *R*, the distance rope; *S*, the anchor rope. Both ropes are of soft, pliable wire. The length of the distance rope is adjusted to the submerged

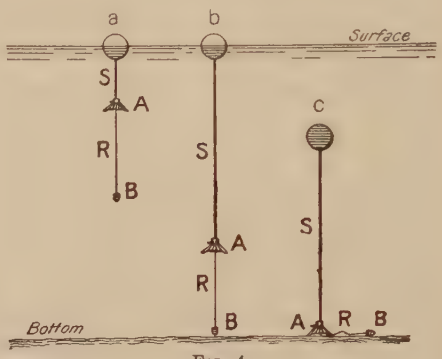


Fig. 4.

distance of the mine, 10 feet. Distance weight, anchor, and mine are dropped from the mine planter when over the selected position. The distance weight (usually of lead or with a lead filling) sinks rapidly until the distance rope is fully extended; the anchor does not sink with the same speed, being of less dense material and having a cavity which has to fill with water slowly. As long as the weight of *B* hangs on the clutch *E* (Fig. 3) the reel *D* is free to turn and unreel the anchor rope, but as soon as *B* reaches the bottom the reel is locked. The weight of the anchor then drags the mine the required distance below the surface.

Mines of all the types mentioned are in common use, their various characteristics fitting them to different local conditions. Self-acting mines have the advantage of (1) being comparatively cheap, (2) can be kept in store ready for immediate use, (3) do not require specially trained men or observation mining stations, and (4) extempore mines can be easily made. But self-acting mines are all (1) rather dangerous to put out or pick up, (2) the condition of the ignition apparatus cannot be tested after the mine is placed in position, (3) they are as dangerous to friend as to foe when once placed, and (4) the contact pins and levers, for mechanical or electrical firing, may become so oxidized, rusted, or overgrown with barnacles or seaweed as to prevent their operation; this condition is quickly reached in the tropics. After being two months in the water the Spanish self-acting torpedoes (in 1898) were so overgrown with barnacles that none was in a condition to explode if struck by a ship; indeed, the United States ships struck them without causing explosion, and one mine was drawn into the propeller and hit repeated hard blows. The objections to this type are evidently such as to preclude their use in important channels where controlled mines can be placed.

Ground mines are only suitable for shallow channels. In deep water buoyant mines must always be used. They are anchored with a submergence of 5 to 20 feet below the surface and at distances apart sufficient to prevent being set off by shock from the explosion of others. For

mines filled with guncotton the extreme destructive range (according to Gen. H. L. Abbott, U. S. A.) is 14.7 feet for a 100-pound charge, 20.5 feet for a 200-pound charge, and 31.7 for a 500-pound charge. The safety interval between mines or groups should be at least eight times the extreme destructive horizontal range. Mines are now commonly filled with trinitrotoluol, which is more destructive than guncotton, but the safety range is believed to be about the same. The necessity for separating mine groups by two or three hundred feet leaves a wide interval through which a ship might pass. For this reason, and to insure her destruction in case some of the mines should fail to act, mines and mine groups are laid in several lines across the channel, the units of each line opposite the intervals in the adjacent ones. Self-acting mines are usually anchored separately, controlled mines in groups. Self-acting contact mines are frequently anchored in pairs with a line between them. If a vessel strikes the line she draws both mines alongside and explodes them.

The removal of mines is effected by sweeping or countermining. Sweeping or dragging may be effected in various ways, but is most expeditiously performed by two vessels. These steam abreast each other, a few hundred feet apart, dragging a stout wire rope, each having an end on board and the bight sliding along the bottom behind them. When one or more mines are gathered in the bight of the rope they are exploded by gunfire or a detonating charge. The operation of sweeping for mines is manifestly very dangerous unless the draft of the vessel engaged is shallow enough to pass over a mine field without hitting the mines. In the Great War of 1914 steam trawlers were much used by the British for this work, while various devices were employed in the Dardanelles, where much destruction was caused by the Turkish mines. Countermining is the explosion of mines by similar devices called countermines. Countermining is useful in clearing a narrow channel through a mine field. The countermines are laid in two or three rows along the channel to be cleared and close enough together to insure the explosion of any mines lying between them.

Modern submarine mines contain from 200 to 1000 pounds of guncotton or trinitrotoluol. Judging from the destructive force of mines in the European War a large proportion of the German mines had 500 pounds or more of explosive. When such a mine is exploded in contact with the bottom or side of a ship the result is instant destruction of the adjacent part of the hull and the sinking of the ship in a very few minutes.

The submarine mine played a very important part in this great war. It is a well-established rule of international law (q.v.) that no belligerent nation has any control of the high seas, which include all waters more than 3 miles from the coast of any nation. Notwithstanding this, the Germans strewed contact mines over a great part of the North Sea and across the ordinary trade routes. The British followed by mining another considerable area, though they defined the limits of their mines and notified neutral powers. The Germans later defined safe routes past their mines. Whether drifting mines were put out was not known. If not, then many anchored mines broke adrift. The number of neutral vessels and lives destroyed by mines when pursuing presumably safe routes was large. In the first part of the war, up to Dec. 18, 1914, 8 Swedish vessels were sunk with a loss of life between 50 and 60; 6 Danish vessels with 6 lives; 5 Norwegian vessels with 6 lives; and 3 Netherland vessels with 15 lives. As mines are weapons of defense, the naval force acting on the offensive usually suffers most from their operation. In the last Russo-Japan War Japan lost two battleships, the Russians one. In the European War, up to March 20, 1915, the British lost by mines 3 battleships, 1 armored cruiser, 5 cruisers, 4 gunboats and torpedo vessels, 3 submarines, and 4 auxiliaries; the French, 1 battleship; the Japanese, 1 cruiser and 2 torpedo boats; the Germans, 1 armored cruiser; the Austrians, 1 cruiser and 2 torpedo boats; and the Turks, 1 gunboat.

Bibliography. J. S. Barnes, *Submarine Warfare* (New York, 1869); Charles Sleeman, *Torpedoes and Torpedo Warfare* (2d ed., Portsmouth, England, 1889); Sueter, *Evolution of the Submarine Boat, Mine, and Torpedo* (London, 1907); *Proceedings of the United States Naval Institute* (Annapolis, bimonthly); United States Naval Institute, *Ordnance and Gunnery* (Annapolis, Md., 1910); *Scientific American* (New York, 1914–15). See EXPLOSIVES; INTERNATIONAL LAW; TORPEDO; WAR IN EUROPE.

MINE ACCIDENTS, PREVENTION OF. Mining from its nature is one of the most hazardous occupations, but the extent and degree of the dangers depend in large measure upon the precautions taken. The nature of the hazard is shown by the statement that, in 1913, 1,047,000 men were employed in coal and metal mines, and in quarries in the United States, and of this number 3651 were killed, which is at the rate of 3.49 per 1000 men employed. In 1912 the rate was 3.22 and, in 1911, 3.58. Such figures and those in the accompanying tables

DEATH RATES IN MINING VARIOUS MINERALS, UNITED STATES *

KIND OF MINES	Rate per 1000 men employed	
	1912	1913
Coal	3.27	3.73
Copper	4.62	4.20
Gold	3.99	3.43
Iron	3.76	3.23
Lead and zinc	3.77	3.31
Miscellaneous minerals	1.52	2.54
Average for metal mines	3.91	3.54
Quarries	1.88	1.72

* Compiled by A. H. Fay, United States Bureau of Mines.

properly may be studied with a graphical comparison of the death rates of coal mining in the United States and in European coal-mining countries from 1895 to 1913. This indicates that the United States death rate has been much higher in recent years than those of the other countries and shows the need of greater care in American mining.

Lessening Accidents in Metal Mines. Investigations indicate that the majority of mining accidents are caused by carelessness of one of the victims, although in many instances they are due to forgetfulness or absent-mindedness. One of the remedies is constantly to set before the miners such reminders, warnings, and safeguards that they will be led to take greater care.

Taking up the classification of accidents in the table herewith it will be observed that the largest number from any one cause in metal

CLASSIFICATION OF FATAL ACCIDENTS IN METAL MINING, UNITED STATES *

CAUSE	1913	
	Number killed	Percentage
By falls of rock or ore	220	32.21
By explosives	77	11.28
By haulage accidents	35	5.13
By falling	52	7.62
By skip or cage	34	4.98
By other causes	265	38.78
Total	683	100.00

* Compiled by A. H. Fay, United States Bureau of Mines.

mines is due to falls of rock from the hanging wall, or overhanging ore. A lessening of the number of such accidents can be obtained by careful inspection of the walls, barring or picking down the loose bowlders, and by systematic timbering. Great improvement has been effected in some mines by employment of special inspectors, but it is inevitable that there will be some accidents from falls, though they can be materially lessened by proper care. Then, in the case of the use of explosives in metal mines, accidents from this source are due almost entirely to carelessness, forgetfulness, or improper methods. Premature firing, drilling into old charges, thawing out of frozen explosives, carelessness in handling these, dangerous magazines, and placing detonators and explosives together, all are prolific sources of accident. Haulage accidents are due to men being squeezed between the car and the side of the passage, to electrocution by touching the trolley wire, to the running away of a car, or a trip on a grade. These are all preventable by the use of proper safeguards.

Accidents classified "by falling" are from men falling down shafts, winzes, or steep stopes. Obviously the remedy is better ladders and landing places and the protection of edges of open areas by fences, gates, and other guards. Skip or cage accidents are generally due to bad design or arrangement, or defective workmanship, or to using worn-out or defective ropes for hoisting. Such accidents should be of the rarest occurrence. Generally speaking, greater care and more intelligent planning will eliminate many accidents classed as miscellaneous as well as those classified here.

Lessening Accidents in Coal Mining. It will be observed that by far the largest number of accidents from any one cause is from falls of roof, being about 40 per cent of the whole, and if falls from the face or pillar coal be included it makes nearly one-half of the total. Such accidents cannot be entirely prevented, but the number may be very greatly lessened by picking and barring down loose roof or coal; by systematic timbering, which consists in placing posts or timber sets at fixed intervals rather than haphazard (although the cost is greater); better methods of testing roof, which is by the sense of touch rather than by sound, i.e., when the roof is struck with a bar or hammer, if it is loose it will vibrate, whereas whenever a large rock is struck it is difficult to judge by the sound whether the rock is loose or not. Closer

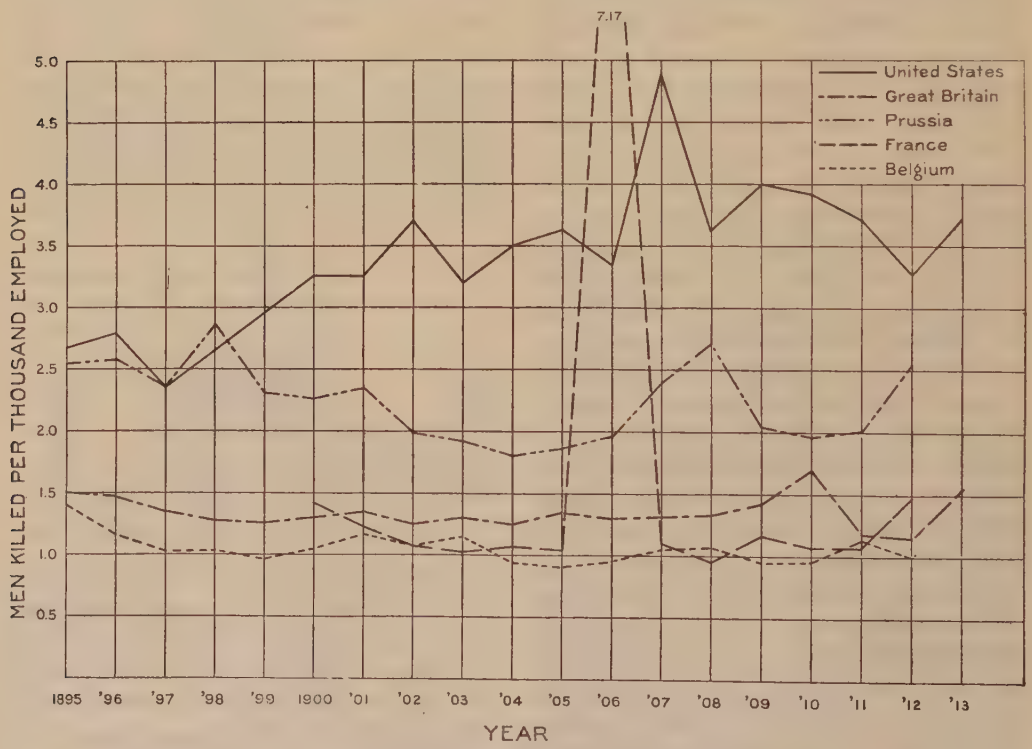


CHART SHOWING FATALITIES IN MINING OPERATION.

INVESTIGATING MINE ACCIDENTS

1. Smoke projected by an explosion from experimental mine, Bruceton, Pa
2. Rescue party equipped with oxygen apparatus, safety and electric lamps, canary bird, and life line, entering experimental mine of United States Bureau of Mines after an explosion
3. Interior of a United States Bureau of Mines Rescue Car

PREVENTING MINE EXPLOSIONS

1. Rice concentrated rock dust barrier. Appearance after successfully stopping a light pressure, slow moving explosion The shelves have dropped and have been caught by chains, the rock dust having been distributed by the force of the explosion.

2. Reinforced concrete stopping in experimental mine, Bruceton, Pa., broken by an explosion.

and better supervision of timbering at the face is of great advantage; this is obtained by the employment of district or face bosses, so that every place can be visited several times a day. In some mines an improper system of mining is employed, which increases the hazard of dangerous falls. Excessive charges of explosive shatter the roof. As large charges are employed in shooting off the solid, it is of great advantage to undercut the coal either by hand or machine, thus requiring the use of smaller charges of explosive.

CLASSIFICATION OF FATAL ACCIDENTS IN COAL MINING *

CAUSE	1912		1913	
	Number	Percentage	Number	Percentage
By falls off roof	972	41.19	1,060	38.06
By falls of face or pillar coal	179	7.58	204	7.33
By mine cars and locomotives	362	15.34	424	15.22
By coal-dust explosions	137	5.80	423	15.19
By gas explosions and burning gas	164	6.95	91	3.27
By explosives	133	5.64	138	4.96
By other causes	413	17.50	445	15.97
Total	2,360	100.00	2,785	100.00

* Compiled by A. H. Fay, United States Bureau of Mines.

Accidents by haulage are due to runaway trips and cars, to catching men between the car and the side of entry, and to electrocution from touching the trolley wire. The increased use of manways, or nonhaulage roads, serves to prevent haulage accidents, as do also providing greater clearance allowance on one side of haulage ways, the placing of shelter holes at regular intervals, the guarding of trolley and feed wires by sideboards, equipping cars with better brakes, and in dipping places the careful blocking of cars. The formation of systematic rules in regard to haulage and signaling and their enforced observance will reduce the number of accidents from this cause.

Accidents from Use of Explosives other than Explosions. Practically all explosive accidents result from careless handling and distribution of explosives. The making up of cartridges of black powder with an open light on the miner's cap, careless handling of detonators, and drilling into old charges are a few of the most prolific causes. To these may be added the improper storage of explosives underground, i.e., failure to put in boxes by themselves; the detonators should always be stored separately and apart from the explosive proper.

Fire-Damp and Coal-Dust Explosions. Although the total number of deaths due to inflammation of fire damp and explosions for any one year have always been less than those due to falls of roof material, nevertheless, since individual accidents of this nature often cause the deaths of large numbers, public attention is focused by the horror of such disasters. Special attention therefore has been paid in all coal-mining countries to the investigations of explosions with the view to their prevention. There have been a great many explosions in which from 100 to 400 men have been killed at a time. The greatest explosion that ever occurred with respect to the number killed was at Courrières, France, in 1906, when 1099 men were killed.

Cause of Fire-Damp Explosions.—Inflammable gas, chiefly methane (CH_4), is found in nearly all coal mines except those at comparatively shallow depths. Ordinarily the gas is diluted and carried away by an air current, but if the mine-ventilation arrangements are poor, accumulations of fire damp may occur, and if one of these is ignited by a flame or a spark an explosion may result. Explosions of fire damp are caused usually by open lights, but they may be produced by the flame of explosives and sparks or arcs from electric machinery.

Prevention of Fire-Damp Explosions.—To prevent gas explosions it is necessary, first, to cause, by means of fans, the circulation of sufficiently strong air currents through all portions of the mine to dilute and carry away the inflammable gas; second, the use of approved* safety lamps or the recently developed miner's permissible* hand or cap electric lights, instead of open lights; third, the use of short-flame permissible* explosives instead of black powder and dynamite; and fourth, the use of explosion-proof motors* or the withdrawal of electric equipment from the gaseous sections of the mine.

EXPLOSION DISASTERS IN AMERICAN MINES IN EACH OF WHICH OVER 100 MEN WERE KILLED

1839	March 18,	Black Heath, Va.	*40
1884	March 13,	Pocahontas, W. Va.	114
1891	January 27,	Mammoth, XXX.	109
1891	February 21,	Springhill Mines, N. S.	125
1900	May 1,	Scofield, Utah	200
1902	May 19,	Coal Creek (Fraterville, Tenn.).	184
1902	May 22,	Fernie, B. C.	125
1902	July 10,	Rolling Mill Mine, Johnstown, Pa.	112
1903	June 30,	Hanna, Wyo.	169
1904	January 25,	Harwick, Pa.	178
1905	February 20,	Virginia City, Ala.	111
1907	December 6,	Monongah, W. Va.	358
1907	December 18,	Darr, Pa.	239
1908	November 28,	Marianna, Pa.	154
1911	April 8,	Banner Mine, Ala.	128
1913	October 22,	Dawson, N. Mex.	258
1914	April 28,	Eccles, W. Va.	181
1914	June 19,	Hillcrest, Alberta	189
1915	March 2,	Layland, W. Va.	111

* First explosion disaster reported.

NOTABLE EXPLOSION DISASTERS IN EUROPEAN COUNTRIES

		Lives lost
1894	Albion, Great Britain	290
1894	Camphausen, Saarrevier, Germany	181
1906	Courrières, France	1099
1908	Radbold, Ruhrrevier, Germany	360
1909	West Stanley, Great Britain	167
1910	Pretoria, Boeton, Great Britain	344
1913	Universal, Great Britain	439

* Officially tested by United States Bureau of Mines and approved as comparatively safe for use in gaseous and dusty mines.

Causes of Coal-Dust Explosions.—Coal dust in a pile or layer is not explosive, but when it is raised into the air in a dense cloud and is then ignited it will explode violently. Two things are therefore necessary to originate a coal-dust explosion—a means of making a dust cloud and a means of igniting it. Both conditions may be caused by a single agency, such as a blown-out shot (i.e., blast) or a small gas explosion. A blown-out shot is so called when the energy of the powder is not used in breaking the coal but blows the stemming or tamping out of the drill hole. After the first cloud of dust is ignited the pressure of the explosion may form clouds beyond, which in turn will be ignited, and the process continues, so that the explosion advances with increasing strength as long as there is fuel available.

Prevention and Stopping of Coal-Dust Explosions.—Plans for prevention comprise decreasing the amount of coal dust made in mining operations, preventing cloud formation by wetting the dust or making it noninflammable by increasing the incombustible content of the dust clouds, eliminating means of ignition by use of safety lamps and permissible explosives, and, finally, confining explosions to small areas by "barriers." The accumulation of coal dust on roads can be greatly decreased by the use of tight cars, so that the fine coal dust cannot fall out, and by loading cars only to the top of sideboards, so that the coal will not be jarred off in transit.

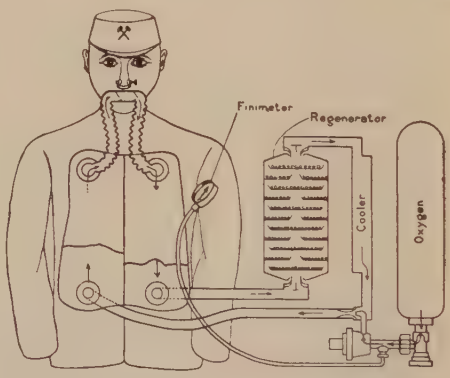
Wet methods of rendering coal dust inert comprise saturating the air current by steam or sprays so that it will not dry out the mine dust, and sprinkling by sprays from water cars or by pipe lines and hose. Calcium chloride and other less deliquescent salts are sometimes used on the roads to keep the road dust wet. Coal dust to be nonexplosive must be wet enough to ball in the hand.

Dry methods of preventing coal-dust explosions comprise covering all surfaces with fine incombustible rock dust artificially ground; then, if the dust is blown up into a cloud, the cloud will contain so much incombustible matter that it cannot explode, the rock dust, if that is used, absorbing heat and separating the coal-dust particles. This method has the advantage over the use of water that the latter evaporates rapidly unless the air current is nearly saturated, while the rock-dust protection remains good for long periods.

As open lights and blow-out shots of long-flame explosives are the most common igniting means of starting explosions, the replacement of them by safety and electric lamps and permissible explosives has greatly decreased the possibility of explosions occurring.

J. Taffanel, a French investigator, developed the first barrier or concentration of rock dust for stopping explosions, in case they start through failure of initial preventive means. It consisted of 10 to 15 boards placed across the mine passages just beneath the roof and loaded with rock dust. If an explosion occurred the dust was blown or upset from the shelves and quenched the flame, thus preventing the passage of the explosion to points beyond. These barriers operated successfully except in rare cases when the explosion was a slow-moving one. To take care of such cases and to protect the rock dust from wetting where wetting methods were employed, closed rock-dust barriers were designed by George S. Rice, chief mining engineer of the Bureau of Mines, and tested at the Bruceton Experimental Mine of the United States Bureau of Mines, successfully extinguishing explosions and meeting the conditions above mentioned. The accompanying illustration shows one type, the "Concentrated Rock Dust Barrier," after extinguishing a very light explosion. It will be noted that the bottom boards have dropped, allowing the dust to sift down. In a violent explosion the whole barrier is smashed and three tons of rock dust immediately launched into the blast.

Rescue Work. Before the discovery of rescue apparatus and the development of modern methods of mine recovery rescue parties sometimes rushed into a mine after an explosion and lost their lives by suffocation from afterdamp, or by igniting gas with open lights and causing secondary explosions. In modern methods exploration is made in advance of bratticing parties by trained rescue crews equipped with the self-contained oxygen breathing apparatus, safety and electric lamps, and canaries. Such exploration hastens the discovery of any who may still be alive and insures the absence of mine fires before the restoration of the air current. The breathing apparatus is so attached to the wearer that he breathes no air or gases



CIRCULATING SYSTEM OF ONE TYPE OF RESCUE APPARATUS WITH MOUTH-BREATHING DEVICE.

from without the apparatus. It furnishes him with air having a high percentage of oxygen and constantly removes the carbon dioxide from the air exhaled by the wearer. The accompanying diagram shows the air circulation of the apparatus.

Safety lamps (q.v.) are carried by the crews to test for inflammable gas and black damp, the latter term being applied to mixtures of carbon dioxide and nitrogen. Portable electric lamps give a strong light, which is necessary for exploration work and, not using oxygen like the safety lamps, furnish illumination in any atmosphere. The actions of the canary indicate the absence or presence of small percentages of carbon monoxide (atmospheres containing only 0.25 per cent are dangerous to breathe), to which it is much more sensitive than small animals and human beings, so that if the canary is not overcome it is safe to permit men without apparatus to advance.

Many thousands of men have now been trained in the use of rescue apparatus and in rendering first aid to the injured by the United States Bureau of Mines, the State rescue stations of

Illinois, and by instructors of private stations maintained by mining companies. There are, therefore, crews in every mining district who are competent to assist in rescue work in time of disaster and alert at other times to do all in their power to prevent accidents or to furnish first aid in case of accident.

Bibliography. Sir F. A. Abel, *Mining Accidents and their Prevention* (New York, 1889); G. M. Bailes, *Modern Mining Practice* (5 vols., Sheffield, England, 1906); H. Schmerber, *La sécurité dans les mines* (Paris, 1910), containing a bibliography; J. H. Dague, *Mine Accidents and their Prevention* (Scranton, 1912); also reports, technical bulletins, and miners' circulars of the United States Bureau of Mines, available upon application or through the Government Printing Office, Washington; also official reports of Pennsylvania, Illinois, and other States.

MINE GAS. Many coal mines contain gas of an explosive nature. The most common of these is marsh gas, CH_4, which is very explosive if mixed with the right proportions of air. This mixture is known to miners as fire damp. Other gases found in coal mines and which may be dangerous in one way or another are carbonic-acid gas, CO_2 (called black damp or choke damp), and carbon monoxide, CO (white damp). Afterdamp is a gas present after an explosion of gas in the mine and is very dangerous. On account of mine gases, miners often have to use safety lamps for illumination, these lamps being so constructed that the flame does not come in contact with the air and gas in the mine workings. The danger of explosion is also minimized by thorough ventilation. Consult bulletins issued by United States Bureau of Mines. See COAL; SAFETY LAMP.

MINEO, mē-nā'ō. A town in the Province of Catania, Sicily, 27 miles southwest of Catania. It occupies the site of the ancient Menæ, founded by Ducetius, 459 B.C., and captured by the Saracens in 840. The ancient walls and castle are still in evidence. In the vicinity is the famous Lago de' Palici, the Lacus Palicorum, of volcanic origin with mineral springs. Pop. (commune), 1901, 9828; 1911, 8728.

MI'NER, ALONZO AMES (1814–95). An American Universalist minister, born at Lempster, N. H. He was educated in the public schools and after teaching for several years was ordained to the Universalist ministry in 1839 and served as pastor in Methuen, Lowell, and Boston, Mass. He was president of, and professor of ethics and political economy in, Tufts College from 1862 to 1875, when he returned to his former pastorate of the Second Universalist Church, Boston. He was appointed a member of the board of overseers of Harvard University in 1863; served 24 years (1869–93) as a member of the State Board of Education and as chairman of the board of visitors to the State Normal Art School (Boston) from 1873; was for 21 years president of the Massachusetts State Temperance Alliance; and stood as Prohibition candidate for Governor in 1878. He was the original projector of the Universalist Publishing House in Boston and became prominent in the antislavery agitation. He edited *The Star of Bethlehem*, contributed to periodicals, and published: *Bible Exercises* (1854); *Old Forts Taken* (1878); *Doctrines of Universalism*. His *Life* was published by G. H. Emerson (Boston, 1896).

MINER, CHARLES (1780–1865). An American journalist, born at Norwich, Conn. At 19 he removed with his family to the Wyoming valley in Pennsylvania, where he became interested in various newspapers, writing under the pen name of John Harwood. He was a member of Congress from Pennsylvania in 1825–29 and was the first to bring to the official notice of that body the possibilities of silk culture and manufacture in the United States. He returned to the Wyoming valley in 1832. The most important of his publications is a *History of Wyoming* (1845), which contains a description of the Wyoming massacre given by eyewitnesses.

MINER, THOMAS (1777–1841). An American physician, born at Middletown, Conn. After graduating from Yale in 1796, he then taught school and studied law, but turned to medicine and established himself in practice at Lynn, Mass. He was one of the founders of the Yale Medical School and was president of the Connecticut State Medical Society from 1834 to 1837. He is the author of *Essays upon Fevers and Other Medical Subjects* (1823), with Dr. William Tally, and *Typhus Syncopalis . . . or the Spotted Fever, etc.* (1825).

MIN'ERAL ACID, IN MEDICINE. An acid not of animal or vegetable origin. The mineral acids most generally used in medicine are sulphuric (oil of vitriol), nitric (aqua fortis), hydrochloric (muriatic), nitrohydrochloric, and phosphoric. In their medicinal action they have many properties in common.

The strong acids are escharotic, abstracting the waters of the tissues, combining with the albumin and other bases, and destroying the protoplasm. They are very diffusible. Sulphuric and phosphoric acid have a strong affinity for water, completely decomposing tissues to which they are applied; they are therefore powerfully escharotic. Sulphuric acid makes a black eschar, while nitric and hydrochloric acid turn the tissues yellow. They are all astringent to the tissues, hydrochloric being the weakest and sulphuric the strongest in this respect.

These acids diluted produce a peculiar metallic taste in the mouth and a sensation of roughness on the teeth. They stimulate the flow of saliva from the parotid and submaxillary glands. They promote the alkaline secretions of the intestines and of glandular organs (bile, etc.), but check the secretions of acid fluids, as the gastric juice. Given before meals, in small doses, they relieve undue acidity of the stomach by checking the production of the acid gastric juice. At first they aid digestion, being helpful to the action of pepsin; combined with stomachics they are useful in dyspepsia with deficiency of the gastric juice. If continued too long they may impair digestion by lessening the production of the gastric juice. They check fermentation and constipate the bowels, except nitric acid, which relaxes them.

Antidotes for poisoning by these acids are: alkalies, such as bicarbonate of soda, lime water; or in an emergency plaster from a wall may be mixed with water to neutralize the acid; oil, albumin, and milk to protect the mucous membranes. For stimulants, opium and ammonia (intravenously) may be used to counteract the resulting depression of the vital powers. See ANTIDOTE.

All these mineral acids, if well diluted, are classed as refrigerants and are useful in fevers, especially in typhoid. Hydrochloric is here preferable. Nitric is the acid generally preferred

as a caustic, its action being effectual and superficial; it may be applied undiluted to phagedenic ulcers and sloughs, warty growths, and indolent sores. Sulphuric acid, dilute, is appropriate in cases of diarrhœa, colliquative sweating, and as a prophylactic against lead poisoning; it is used also as an acid drink in fevers and before meals in acidity of the stomach. Phosphoric acid is considered of special value in tissue waste and in dissolving phosphatic deposits. All these acids act injuriously on the teeth by attacking the enamel. They should always be administered largely diluted, taken through a straw or glass tube, and the mouth should be thoroughly rinsed at once with an alkaline wash. See NITRIC ACID; HYDROCHLORIC ACID.

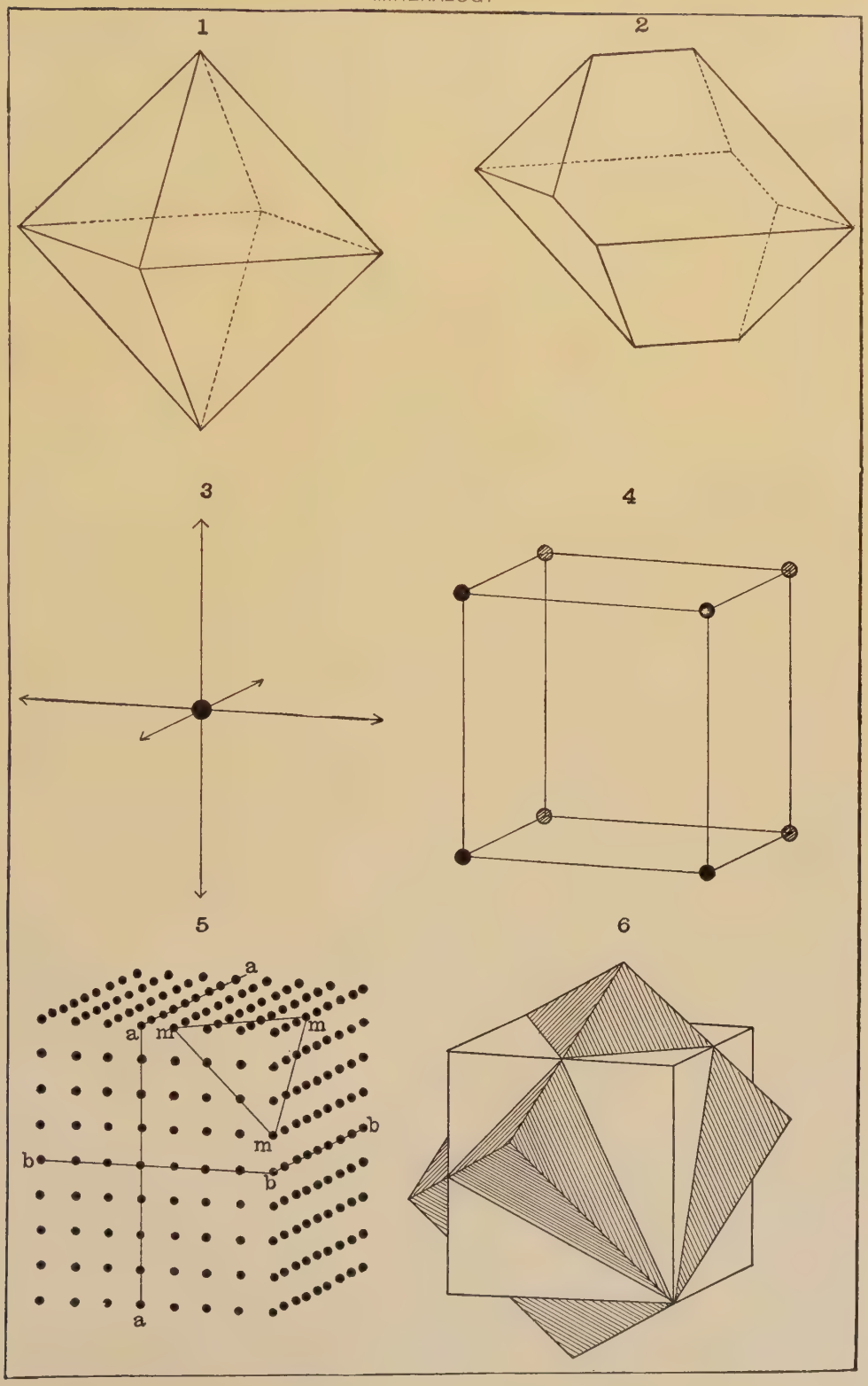
MINERAL COLORS. A term applied to a number of inorganic substances used in the manufacture of paints. The principal mineral colors include the following: *white lead*, consisting chiefly of basic lead carbonate; *zinc white*, or oxide of zinc; *antimony white*, or oxide of antimony; *fixed white* (blanc fixe), artificial or natural barytes, barium sulphate; *mineral white*, or calcium sulphate; *china clay*, or aluminium silicate; *whiting*, or calcium carbonate; native or artificial *yellow ochres*, i.e., earths colored by iron oxide; *litharge, massicot*, or oxide of lead; *strontian yellow*, or chromate of strontium; the chromates of cadmium, mercury, and barium; *mineral yellow*, or oxychloride of lead; *Naples yellow*, or antimonate of lead; *orpiment*, or sulphide of arsenic; *rouge*, Venetian and Indian reds or red oxides of iron; *vermilion* and *cinnabar*, or sulphide of mercury; *Derby red*, or basic chromate of lead; *minium*, or orange mineral (red lead), or lead orthoplumbates; *realgar*, or red sulphide of arsenic; *Brunswick green*, or oxychloride of copper; *Scheele's green*, or copper arsenite; *Schweinfurt green*, a mixture of copper acetate and Scheele's green; *cobalt green*, or cobalt and zinc oxide; *umber*, or brown silicate of iron and manganese; native or artificial *brown ochres*, i.e., earths colored by iron oxide; *Berlin blue*, or ferrocyanide of iron; *Thénard's blue*, or aluminate of cobalt; *ultramarine blue*, a compound of aluminium, sodium, silicon, oxygen, and sulphur; etc. The principal mineral colors are described in special articles or in connection with the metals or acids combined in them. See also PAINTS; PAINTERS' COLORS.

MINERAL DEPOSITS. See ORE DEPOSITS; and the articles on the different ores and minerals.

MINERAL'OGY (by haplology for **mineralology*, from *mineral*, OF. *mineral*, Fr. *minéral*, from ML. *minerall*, ore, from *minera, mineria, minaria*, mine, from *minerarius*, pertaining to mines, from *minare*, to mine, lead here and there, Lat. to drive, from *minari*, to threaten, from *minæ*, threats, from *minere*, to jut out + -λογία, *-logia*, account, from λέγειν, *legein*, to say). The science of those natural substances known as minerals which, together or separately, form the material of the earth's crust and also, as far as our knowledge extends, that of other celestial bodies. A mineral is a substance of definite chemical composition which has been directly produced by the processes of inorganic nature. It must be homogeneous even when submitted to minute microscopic examination and must possess a definite composition capable of being expressed by a chemical formula. Laboratory and furnace products, or such substances as shells and bones of animals, cannot be included in the range of mineralogy. It is the function of the mineralogist to investigate the form, properties, and composition of minerals, their genesis, their relations to one another and to the accompanying rocks, the places where they are found, and the geological conditions under which they are formed. A knowledge of mineralogy is of importance to the geologist in his study of the rock formations, to the mining engineer in his search for metal-producing minerals, and to the metallurgist in the extraction of metals from minerals. Many of the useful arts are directly dependent for their raw materials upon minerals, while some mineral species occur in such brilliancy and beauty of color as to be highly prized as gems.

The Branches of Mineralogy. The general subject of mineralogy may be divided into four sections: 1. *Crystallography*, which includes the description of crystals, their character, classification, the mathematical relations of their faces, and the methods of expressing them graphically and symbolically. (See CRYSTALLOGRAPHY.) 2. *Physical mineralogy*, which describes the physical characters of minerals and deals with the properties related to their molecular structure. 3. *Chemical mineralogy*, which has for its object the determination of the chemical composition of each mineral species and the relation in composition between species in the same chemical group. 4. *Descriptive mineralogy*, which includes the detailed description of each mineral species with respect to its form, structure, physical properties, chemical composition, and geographical and geological occurrence. The division of physical mineralogy is replete with interesting problems of cohesion, optics, heat, and electricity, and suggests to the investigator along physical lines many fields for research. The problems connected with chemical mineralogy, while covering a narrower and less varied field than those of physical mineralogy, are none the less replete with interest. To the chemist working in the field of mineralogy belongs the task of determining the part played by the various elements which enter into the composition of the hundreds of mineral species, many of which are rare and exceedingly complex in composition; the phenomena of isomorphism and dimorphism; and the chemical alteration of mineral species under the action of natural agencies, which is known as pseudomorphism.

Crystallography. With very few exceptions (mercury and water) minerals are limited to solid substances; i.e., they are solid at the present temperature of the earth. In discussing their formation and character we must, however, revert to the period when the mineral constituents of the earth existed in a fluid or semifluid state. When a homogeneous substance passes from a fluid to a solid condition, its particles mutually attract each other along certain definite lines and a solid is built up which shows a definite structural relation between all its integral parts, which relation finds expression in its outward form. Such a solid, formed from a nucleus by the piling up of accretions from without, is known as a crystal and is characterized by a regular polyhedral form, bounded by more or less smooth surfaces. A crystal is, then, the normal form of a mineral which has solidified under ideal conditions and, should its formation be uninterrupted by external agencies, its ap-



1. Normal crystal form developed equally in all directions.
2. Same crystal form as 1, distorted.
3. Crystal molecule showing an arrangement of attractive and repellent forces.
4. Network of molecules formed on the lines of crystallizing forces shown in 3.
5. Further development of network shown in 4 to explain cleavage.
6. Twin crystal formed by two interpenetrated cubes.

pearance would be that of a symmetrical geometric solid with smooth faces and sharp edges and angles. Such are the ideal representations, which serve to illustrate the crystallization of mineral species and which are to be found in all textbooks on the subject. But inasmuch as the ideal conditions mentioned above are of comparatively rare occurrence, it is far more common to find minerals in more or less distorted forms. (See Figs. 1 and 2.) Large and well-formed crystals are, in general, produced by a slow process of crystallization, whereas a rapid cooling or concentration of a mineralizing solution tends to form aggregates often resembling the forms of animate nature; such are the frost patterns which form on windowpanes, the coral-like forms of calcium carbonate to be found in some caves, and many other imitative forms described in the terminology of mineralogy. Where individual crystals are entirely lacking, the mineral is said to be massive, although its structure as determined by optical and other methods may be distinctly crystalline.

Regarding the nature of the crystalline units of accretion, there is at present very little knowledge. They are without doubt extremely minute and may possibly consist of a number of chemical molecules. Whatever may be the size or shape of the crystal units or crystal molecules, it is sufficient for the purpose of discussion to regard them as points. A fuller discussion of this subject will be found under CHEMISTRY. The crystal molecules of any chemical substance crystallizing under given conditions are believed to be identical in size and shape. They are never in contact with each other, but are held in equilibrium by attractive and repellent forces acting along lines which differ for each type of crystal molecule. A crystal molecule having these lines of crystallizing force at right angles, as shown in Fig. 3, would attract like molecules, which would arrange themselves as shown in Fig. 4. The theoretical grouping of molecules has been discussed by Sohncke, Fedorow, Schönflies, and Barlow, who have developed 230 possible groupings. These, however, divide themselves into 32 distinct groups identical with the 32 groups mentioned under CRYSTALLOGRAPHY.

If we assume the molecules of a substance to be grouped as shown in Fig. 5, it will be readily seen that the lines of minimum cohesion will be *aa* and *bb* rather than *mm*, because the former planes are further separated from the next adjacent parallel plane. This explains in a measure the fact that crystallized substances often tend to break or cleave parallel to a primary crystallographic face. Assuming a crystal molecule of any given mineral to be held in equilibrium by forces acting in definite directions, it will be readily seen that the crystal built up from accretions of such molecules will, of necessity, present faces which are symmetrically disposed with respect to those lines of crystallizing force. Thus, we have as a fundamental law of crystallization the principle that a mineral can crystallize only in forms whose symmetry is referable to one of the 32 groups mentioned in the foregoing paragraph. This is known as the law of symmetry. The number of planes possible from the grouping together of crystal molecules of a substance is invariably greater than the number occurring on any given crystal, and modifying planes are common, often running to great complexity and under unusual conditions predominating over the commoner types. Hence we frequently find great variety of form in crystals of the same substance, as is the case with the mineral calcite (q.v.). It should, however, be noted that crystals of a mineral from a certain locality, which are presumably formed under the same conditions, show a marked similarity of type and are readily distinguishable from those of the same mineral from a different locality. This variation in type, which is known as crystal habit, is particularly noticeable in large and widely distributed species. Certain mineral species exhibit a tendency to join two crystals or two halves of the same crystal in such a manner that some crystallographic plane or axis is common to both. This juxtaposition, which is ordinarily distinguished by reëntering angles, is known as twinning. (See Fig. 6.)

It will be readily seen from the above that an accurate knowledge of the occurring crystal forms is of primary importance in the investigation of any mineral species. The identification of the faces of the crystal, which is often attended with considerable difficulty, is accomplished by measuring the interfacial angles by means of an instrument called a goniometer (q.v.) and comparing these with the calculated relations obtained from simple mathematical formulas based on spherical trigonometry. The optical properties of minerals as well as their presence and relations in rocks are determined by means of the petrographic microscope. (See MICROSCOPE.) For exhaustive study along the line of physical characters, elaborate and accurate apparatus is required, while a well-equipped chemical laboratory is almost indispensable to the mineralogical investigator.

Minerals and Rocks. One of the most important phases of mineralogical study, and one which is replete with interest to the geologist, is the relation of minerals to rocks. The division known as the crystalline rocks, in particular, presents a wide and varied series of rock-forming minerals. These may be classed as essential and accessory constituents according as they give character in the rock in which they occur or are present only in insignificant proportions. Quartz, the feldspars, the micas, hornblende, augite, enstatite, hypersthene, chrysolite, garnet, leucite, serpentine, calcite, and dolomite are essential constituents of many crystalline rocks, while such minerals as gypsum, salt, limonite, hematite, siderite, kaolin, magnetite, and apatite often occur in such extensive deposits as to constitute rock masses. Among the accessory rock-forming minerals may be mentioned graphite, corundum, vesuvianite, chiastolite, cyanite, tourmaline, zircon, titanite, etc. Many geologists have made use of the mineralogical character of rocks as a basis of classification, particularly in the case of the igneous rocks, and, though open to some objection from the standpoint of geological inquiry, the system as applied to crystalline rocks has much to commend it.

Mineral Chemistry. Comparatively few elements exist in nature uncombined; the great majority of minerals occur as salts of relatively few mineral acids. Minerals crystallizing from a mineralizing fluid, whether it be a solution or a fusion, combine the elements existing in that fluid in strict accordance with the laws of chemistry. The resulting minerals may, however, be somewhat modified by the presence of elements foreign to their typical formulas, as in the case

of the emerald variety of beryl, which owes its brilliant green color to the presence of a small amount of chromium not represented in the normal composition of beryl. Again, certain elements closely related in chemical character frequently replace one another in mineral composition, the relative proportions varying between limits and giving rise to a group of closely related compounds. Such is the columbite-tantalite group, which presents all the gradations from normal columbite ($FeNb_2O_6$) to normal tantalite ($FeTa_2O_6$). Minerals closely related in composition often exhibit a striking similarity in crystal form. When such isomorphous compounds are present in the same magma they are not separable in the process of crystallization, but tend to produce a mineral intermediate in composition, as when the isomorphous carbonates dolomite and siderite grade into the intermediate compound ankerite. An extremely interesting group is that of the triclinic feldspars or plagioclases, which are regarded as isomorphous mixtures of the molecules of the two isomorphous species albite and anorthite. Mineralogy affords several examples of mineral species identical in chemical composition, but crystallizing in forms which are essentially different. This condition, which is known as dimorphism, is represented by the two calcium carbonates calcite and aragonite and by the two iron disulphides pyrite and marcasite. Titanium dioxide, which is trimorphous, occurs as rutile, octahedrite, and brookite.

Classification of Minerals. The most logical and convenient scheme of classification of minerals is that which is adopted by Dana in his *System of Mineralogy* and which is now, with slight modifications, universally used. By this method mineral species of similar composition are placed together in classes which are subdivided into divisions. These in turn are split up as far as possible into isomorphous groups. The principal classes are:

1. Native elements.
2. Sulphides—sulphides, selenides, tellurides, arsenides, and antimonides.
3. Sulpho salts—sulpharsenides, sulphantimonides, and sulphobismuthites.
4. Haloids—chlorides, bromides, iodides, and fluorides.
5. Oxides.
6. Oxygen salts—carbonates, silicates, and titanates; niobates and tantalates; phosphates, etc.; borates and uranates; sulphates, etc.; tungstates, molybdates.
7. Salts of the organic acids.
8. Hydrocarbons.

Uses of Minerals. By far the most important of the uses to which minerals are put is that of producing metals from those of them which contain metal constituents in sufficient quantity to render their mining profitable. The discussion of the distribution and mode of occurrence of metallic ores involves many questions of a purely technical nature and belongs essentially to the province of ore deposits (q.v.). A few metals such as gold, platinum, copper, arsenic, and to some extent silver, antimony, bismuth, and mercury, are found native, i.e., uncombined with other elements. The majority of the metallic ores, however, occur as sulphides, oxides, or carbonates of the various metals, or more rarely as arsenides, tellurides, chlorides, or silicates. Association of metallic minerals in more or less intimate mixtures often gives rise to highly complex ores. Many ores which are essentially compounds of the base metals contain gold and silver in appreciable amounts and are profitably mined for the latter metals, as is the case with the argentiferous galena of Colorado, Montana, and Utah.

The nonmetallic minerals, although of less importance commercially than the metallic ores, are none the less of great and increasing value in the arts. These are grouped, with reference to their application, into: 1. Substances used for chemical purposes, embracing the minerals employed in the manufacture of acids, chemicals, soda, alum, plaster of Paris, etc. 2. Ceramic materials, used in making pottery, bricks, tiling, paving blocks, terra cotta, porcelain, and glass. 3. Refractory materials, used in the manufacture of fireproofing, linings of furnaces, crucibles, and asbestos fabrics. 4. Abrasives, embracing diamonds, emery, garnet, and quartz sand. 5. Graphic materials, embracing chalk, graphite, pencil stone, lithographic limestone, etc. 6. Pigments, including minerals ground for paints, and paint adulterants. 7. Fertilizers, represented by the lime phosphates, marls, and land plaster. 8. Mineral fuels, including coal, petroleum, and natural gas. The use of certain minerals for gems is probably of very ancient origin. The extreme hardness of the diamond, sapphire, ruby, emerald, chrysoberyl, and other precious stones protects them from injury and renders them capable of being highly polished.

Synthetic Mineralogy. Almost all of the important minerals have been successfully produced artificially, and much light has been thrown upon the formation of natural minerals in this way. The methods applied to this line of research involve in the majority of cases a fusion at a high heat for a long period. In a number of instances artificial minerals have been accidentally produced in the course of various metallurgical operations, and the interiors of retorts and furnaces often furnish interesting examples of this phase of mineral genesis. In point of economic importance these experiments, though interesting, have not as yet achieved a marked degree of success in the production of gems, except in the case of the corundum gems, which are now manufactured and sold as synthetic sapphires.

Analysis of Minerals. The determination of minerals is largely a question of experience gained by the study of large and varied collections of specimens. The eye becomes trained by practice to recognize crystallizations even in distorted and imperfectly exposed forms, to associate certain colors, lustre, and structure with definite species, and to associate certain minerals with certain rock matrix. Several physical properties are of considerable aid in identifying questionable specimens, as, e.g., the color of the powdered mineral as shown by rubbing it on unglazed porcelain, the approximate relative hardness as determined by scratching the specimen with a knife point, and the relative weight as roughly determined by weighing the specimen in the hand. These rough determinations, which are of particular value as field methods, may be supplemented, with the addition of some simple and portable apparatus, by determinations of solubility and fusibility. A more detailed examination of the composition of a mineral involves recourse to the blowpipe analysis. Blowpipe analysis, as it is at present

MINERALOGY

INCRUSTATIONS ON PLASTER OF PARIS SUPPORT

INCRUSTATIONS ON CHARCOAL SUPPORT

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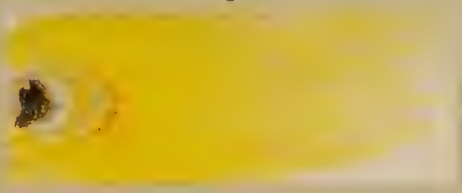
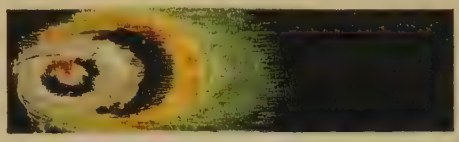


LEAD IODIDE

1



LEAD IODIDE

4

BISMUTH IODIDE

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BISMUTH IODIDE

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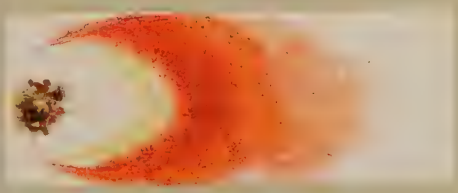
ANTIMONY IODIDE

5

ZINC OXIDE IGNITED WITH COBALT NITRATE

8



MERCURY IODIDE

7

TIN OXIDE IGNITED WITH COBALT NITRATE

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BLOWPIPE REACTIONS FOR THE FUSIBLE METALS

practiced, consists of a quantitative chemical analysis on a small scale. For this purpose very small portions of the substance to be examined are used, and most of the chemical reactions involved are effected by means of some form of blowpipe (q.v.). Formerly the methods of blowpipe analysis were extended and elaborated to include quantitative determinations, but the smallness of the samples which could be successfully treated rendered the results of quantitative blowpipe analysis inexact, even when practiced by a skilled and experienced manipulator, and this branch has now been abandoned in favor of the more reliable methods of quantitative analysis (q.v.). Some idea of the results obtained by blowpipe analysis will be gained by an examination of the accompanying plate, which shows the reactions obtained from some of the fusible metals by heating their compounds with suitable fluxes on charcoal and plaster supports. The coatings of iodides are produced by using a flux composed of two parts sulphur and one part each of potassium bisulphate and potassic iodide. Reactions for iron, copper, manganese, nickel, cobalt, chromium, and other metals are obtained by dissolving small portions of their compounds in hot beads of borax or microcosmic salt and subjecting the resulting fusion to the oxidizing and reducing action of the blowpipe flame. The color imparted to the blowpipe flame serves as a test for compounds of calcium, strontium, lithium, barium, sodium, and other elements. These tests as well as others of similar nature merely announce the presence or absence of an element; the relative amount when required must be determined by a systematic quantitative analysis.

History. Although a few mineral species were known to philosophers at an early date in the world's history, it was not until the development of chemistry from alchemy in the sixteenth century that savants approached the subject of mineralogical knowledge in the true spirit of scientific investigation. As a natural outcome of the comparatively advanced state of mathematical knowledge at the period of this scientific awakening, the subject of crystallization early developed a marked importance. In 1783 Delisle, with the aid of a primitive form of goniometer, measured the interfacial angles of a number of crystals and established the law of constancy of interfacial angles. The Abbé Haüy about the same time developed a theory correlating the internal structure of crystals with their outward form. He practically formulated the law of rational indices which constitutes the corner stone of crystallography. Haüy was followed by Hausmann with his application of spherical trigonometry in 1803, Weiss with a development along purely mathematical lines in 1814, Mohs with a division of crystals into six systems in 1822, Naumann in 1823, and W. H. Miller in 1839. In recent years the science has made vast strides, and new methods and lines of research are being constantly developed. Our knowledge of the science of mineralogy is constantly enriched by the discovery of new species, while mining and quarrying operations are continually bringing to light new and interesting crystalline forms and varieties of well-known minerals.

Research in physical mineralogy is being extended, notably in Germany, along a number of lines, and from time to time valuable additions are made to our store of knowledge by careful and exhaustive studies of the optical, thermal, and electrical properties of certain mineral species. A method by which the symmetry of crystallized minerals may be investigated has been developed by Baumhauer, Beck, and others. This method depends upon the development of minute angular cavities upon crystal faces by means of the interrupted action of some dissolving medium. The symmetry of these pits, which are known as etch figures, conforms to the crystallographic symmetry of the mineral experimented upon. Of a similar nature in their bearing upon the question of crystal structure are the percussion figures and solution planes which have been made objects of special study by several authors.

The artificial formation of minerals opens another line of research upon which much valuable work has been done by Daubrée, Fouqué, Michel Lévy, Friedel, Bourgeois, Meunier, and others.

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In addition to these the reader is referred to the volumes on *Mineral Resources of the United States*, published by the United States Geological Survey (Washington, 1882 et seq.).

MINERAL PAINT. See PAINT, MINERAL.

MINERAL POINT. A city in Iowa Co., Wis., 50 miles west of Madison, the State capital, on the Chicago, Milwaukee, and St. Paul and the Mineral Point and Northern railroads (Map: Wisconsin, C 6). It contains an attractive high-school building, a public library, and a municipal auditorium. The chief industry is the manufacture of oxide of zinc, lead and zinc both being found in the vicinity. The water works are owned by the city. Pop., 1900, 2991; 1910, 2925.

MINERAL TALLOW, or HATCHETTITE. A yellowish-white, soft, flexible mineral wax or tallow that melts at 46° or 47° C. and consists of about 86 per cent of carbon and 14 per cent of hydrogen. It is found in the coal measures in Glamorganshire, Wales; Argyleshire, Scotland; and Moravia, Austria. See OZOCERITE.

MINERAL WATERS. The term usually applied to spring or well waters which have a variable quantity of solid substances in solution, and on this account may exert effects on the human body different from those of ordinary water. Mineral waters have been used as remedial agents from a very early period. The oldest Greek physicians had great faith in their curative power, and the temples erected to Æsculapius were usually close to mineral springs. We are indebted to the Romans for the discovery not only of the thermal springs in Italy, but also of some of the most important springs in other parts of Europe, as those of Aix-la-Chapelle, Baden-Baden, Bath, and Spa in Belgium. In the United States mineral springs have also attracted attention since an early period. At Saratoga Springs, e.g., the High Rock Spring was known to the white people as early as 1767, and the American aborigines seem to have been acquainted with its important properties even before that date. In West Virginia and Virginia seven springs were already noted in 1831, and of these the Bath mineral spring, now known as the Berkeley Spring, was visited as early as 1777, while the White Sulphur Springs were utilized in 1778. The therapeutic action of mineral waters or spas, as they are frequently termed, depends largely on their chemical composition and their temperature, although a variety of other circumstances, such as situation, elevation, climate, mean temperature and, above all, the regular habits of the patient, have no doubt an important bearing on the success of the treatment.

Origin. The origin of mineral waters is often looked upon with much curiosity, and yet there is nothing unnatural about it. The rain water falling on the surface soaks down through the soil into the rocks and may slowly filter through them to a considerable depth, coming out to the surface at a lower level in the form of a spring; or again the water may reach sufficient depths to be subjected to great pressure or even heat, and coming to a fissure or being struck by an artesian-well boring, it will tend to escape to the surface through such an outlet. Many mineral springs are found along lines of faulting, since fault fissures afford a means of escape. The dissolved mineral substances no doubt are obtained from the rocks through which the water has flowed. In some cases the waters in seeping through one type of rock may take up certain acids which later react on basic elements contained in other rocks, thus producing salts. Most waters contain some carbonic acid, which greatly increases their solvent powers in the presence of lime, magnesia, and iron; while, if the waters are alkaline, they may take up substances which are ordinarily rather insoluble, such as silica. The attacking power of the water may be still further increased if it is hot. There seems to be some relation between hot springs and the geological structure of a region, as thermal springs are more abundant in areas where the rocks have been highly faulted or where there has been volcanic activity in comparatively recent geological times. Mineral springs commonly contain more dissolved material in regions of sedimentary rock formation than in igneous or metamorphic areas.

Temperature. Springs are commonly characterized as thermal when they have a temperature of over 70° F. If the temperature is between 70° and 98°, they are called tepid, while all exceeding the latter limit are included under hot springs. The following examples will serve to show the degrees of temperature found in different thermal springs: Sweet Springs, W. Va., 74° F.; Warm Springs, French Broad River, Tenn., 95°; Washita, Ark., 140°–156°; San Bernardino Hot Springs, Cal., 108°–172°; Las Vegas, N. Mex., 110°–140°; Sulphur Springs, Aix-les-Bains, France, 108°; Kaiserquelle, Aix-la-Chapelle, Prussia, 131°; Karlsbad (Sprudel), Bohemia, 162°.

Flow of Springs. The amount of water which a mineral spring may discharge is quite variable; thus, 500 springs in central France, which were tested, yielded 2,628,000 gallons in 24 hours, and the famous Orange Spring in Florida is said to discharge 5,000,000 gallons per hour. The discharge per hour of some of the principal American springs is as follows: Champion Springs, Saratoga, 2500 gallons; Roanoke Red Sulphur Springs, Va., 1278 gallons; Warm Sulphur Springs, Bath, Va., 350,000 gallons; Hot Springs, Ark., 20,100 gallons; Glen Springs, Waukesha, Wis., 45,000 gallons; Horeb, Waukesha, Wis., 1500 gallons.

Classification. A classification of mineral waters may be geographic, geologic, therapeutic, or chemical. The following scheme of classification is one adopted by A. C. Peale, a noted authority on the subject of mineral waters, and more especially those of the United States:

CLASSIFICATION OF MINERAL WATERS

- Alkaline
- Alkaline-saline
  - Sulphated
  - Muriated
    - Sodic
    - Lithic
    - Potassic
    - Calcic
    - Magnesic
    - Chalybeate
    - Aluminous
      - Nongaseous
      - Carbonated
      - Sulphureted
      - Azotized
      - Carbureted
- Saline
  - Sulphated
  - Muriated
- Acid
  - Sulphated
  - Muriated
  - Siliceous
    - Sulphated
    - Muriated

The *alkaline* waters include all those containing alkaline carbonates, such as carbonates of

alkalies, alkaline earths, alkaline metals, or iron. About one-half of the alkaline springs of the United States are calcic alkaline, i.e., containing calcium carbonates or bicarbonates as the predominant ingredient. The water of the Hot Springs of Virginia is a hot, carbonated, calcic alkaline water. The *alkaline-saline* waters include those containing combinations of alkaline carbonates with sulphides (sulphated) or chlorides (muriated), there being in the United States one-third as many as of the saline waters. In the *saline* waters sulphides and chlorides predominate; in the United States there are about one-third more springs of this class than of the alkaline springs. Springs which are classified as purgative or aperient will fall in the subclass of sulphated salines. The salines may be sodic sulphated or muriated, or calcic sulphated or muriated; the sodic muriated constitute about 88 per cent of the muriated saline waters of the United States. The *acid* class includes all waters containing free acid, whether silicic, sulphuric, or hydrochloric. In addition to having free acid a spring may also contain salts of the acid.

Geographical Distribution. There are at the present time probably not less than 10,000 mineral springs in the United States, and of this number 838 were listed as commercial producers in 1913. Most of the mineral springs of commercial value are found in the eastern United States and in the Mississippi valley; west of the 101st meridian they are largely confined to the Pacific coast. No hot springs are known in the New England States. In Maine the springs are slightly alkaline-saline and chalybeated, with a few of carbonic character. Their temperature ranges from 40° to 46° F. Chalybeated springs are abundant in Massachusetts. Many of the springs of the New England States are utilized for commercial purposes, but among the Eastern States as a whole New York stands at the head of the list of producers. The springs at Saratoga have an international reputation and compare favorably with any of the foreign spas; they attract great numbers of tourists and health seekers, and their waters are extensively used throughout the United States. These waters are effectual in diseases of the liver, spleen, and skin, in neuralgia, and rheumatic and dyspeptic troubles. Farther south in the Appalachians are the celebrated Hot Springs of Virginia, including the Berkeley Springs and the White Sulphur Springs. The waters of the former are used chiefly for certain forms of dyspepsia, diseases of the liver and bowels, while those of the latter are of special value in the treatment of chronic diseases, gout, rheumatism, etc. The general character of the springs of Virginia and West Virginia is saline; sulphureted waters are the most numerous, but alkaline and chalybeate and acid springs also occur. The saline springs are found in excess of all others in the South Central States, and thermal springs are few. In this region the States of Kentucky, Tennessee, and Arkansas are the chief producers of mineral waters. The Hot Springs of Arkansas are among the most important thermal springs found in the entire country and are of value for diseases of the blood. The Texas springs are peculiar from the fact that many of them show free sulphuric acid. Owing to the abundance of limestone formations in the North Central States, calcic springs are quite numerous, and in Wisconsin those of Waukesha are widely known. In the Cordilleran region the most noted occurrence of hot springs is that of the Yellowstone Park, but they are not used for medicinal purposes. In New Mexico the Las Vegas Hot Springs are often visited, and in Washington the Medical Lake is the source of one of the best-known mineral waters of the Pacific coast.

ANALYSES OF AMERICAN MINERAL WATERS

CHEMICAL CONSTITUENTS	Congress Spring, Saratoga, N. Y. Saline, carbonated	Excelsior Spring, Saratoga, N. Y. Saline, carbonated	Warm Sulphur Springs, Va. Calcic	Hot Springs, Ark. Thermal, carbonated	Red Sulphur Spring, Sharon Springs, N. Y. Alkaline-saline, sulphureted	Las Vegas Hot Springs, N. Mex. Alkaline-saline	Bethesda Spring, Waukesha, Wis. Alkaline-calcic
	Grains per gallon	Grains per gallon	Grains per gallon	Grains per gallon	Grains per gallon	Parts per 1000	Grains per gallon
Sodium carbonate	.....	.....	....	....	....	5.00	
Sodium bicarbonate	10.77	8.75	....	....	.49	....	1.26
Sodium sulphate	.....	.....	....	....	....	16.27	.54
Calcium carbonate	.....	.....	5.22	} 3.17	....	11.41	
Magnesium carbonate	.....	.....	....				
Calcium bicarbonate	143.40	41.32	....	12.66	12.93	....	17.02
Magnesium bicarbonate	121.76	29.34	....	....	.69	....	12.39
Lithium bicarbonate	4.76	.....	....	....	....	Trace	
Iron bicarbonate	.34	3.00	....	2.17	....	....	.04
Magnesium sulphate	.....	2.15	....	....	18.96		
Potassium sulphate	.89	.....	1.38	....	....	....	.46
Sodium chloride	400.44	166.81	....	....	.33	27.34	1.16
Potassium chloride	8.05						
Potassium bromide	.....	1.57					
Sodium bromide	8.56						
Sodium iodide	.14	4.67					
Silica	.84	.53	1.72	.38	.45	2.51	.74
Calcium sulphate	.....	.....	14.53	2.54	96.64		

Foreign Waters. A number of foreign mineral waters are imported into the United States and find a considerable sale. Chief among these is the Apollinaris water, which comes from Ahrweiler, Germany, and which is largely used as a table water and in cases of nervous irritation attended with dyspepsia. The Friedrichshall bitterwater, from the Friedrichshall Springs, near Hildenburg, Germany, is largely used for habitual constipation, as is the Hunyadi-János water from Budapest, Hungary, which is a remedy also for congestive and gouty disorders. The Kissingen waters from Bavaria, the Vichy

from France, and the Karlsbad Sprudel waters are extensively imported into the United States.

Production. The production of mineral waters in the United States in 1913 amounted to 57,867,399 gallons, valued at $5,631,391. The imports in the same year amounted to 3,364,676 gallons, valued at $955,788.

Chemical Analyses. The table on page 725 shows the important constituents of some of the American mineral waters.

Bibliography. Peale, "Lists and Analyses of the Mineral Springs of the United States," in *United States Geological Survey, Bulletin No. 32* (Washington, 1886); Branner, "Mineral Waters of Arkansas," in *Arkansas Geological Survey Report* (Little Rock, 1891); Schweitzer, "A Report on the Mineral Waters of Missouri," in *Missouri Geological Survey*, vol. iii (Jefferson City, 1892); Peale, "Natural Mineral Waters of the United States," in *United States Geological Survey, Nineteenth Annual Report* (Washington, 1898); Crook, *Mineral Waters of the United States and their Therapeutic Uses* (Philadelphia, 1899); De Launay, *Recherche, captage et aménagement des sources thermominérales, origine des eaux minérales, géologie, proprietés physiques et chimiques* (Paris, 1899); Bailey, "Mineral Waters of Kansas," in *Kansas Geological Survey*, vol. vii (Topeka, 1902); Kemp, "The Mineral Springs of Saratoga, N. Y.," in *New York State Museum, Bulletin 159* (1912). For statistics of production, see *Mineral Resources*, issued by the United States Geological Survey (Washington, annually); many references also in the volume for 1913. See BOTTLING AND BOTTLING MACHINERY.

MINERAL WELLS. A city in Palo Pinto Co., Tex., 55 miles by rail northwest of Fort Worth, on the Weatherford, Mineral Wells, and Northwestern and the Gulf, Texas, and Western railroads (Map: Texas, C 3). It is essentially a health resort, owing to its noted mineral wells, and attracts thousands of visitors annually. More than 1,000,000 gallons of the water are bottled and shipped from here every year, and the drinking pavilions of the city are said to be among the largest in the country. Places of interest in the vicinity are Lake Pinto, Elmhurst Park, and Lovers' Retreat, all of great scenic beauty. Mineral Wells adopted the commission form of government in 1913. Pop., 1900, 2048; 1910, 3950.

MINERS, WESTERN FEDERATION OF. A centralized association of persons working in and around mines, mills, and smelters. Its purposes are the general improvement in the conditions of labor and the abolition of such abuses as the truck system, child labor, the employment of private detectives, importation of labor under contract, government by injunction, etc. The officers of the association consist of a president, vice president, secretary treasurer, and an executive board composed of these officers and one organizer from each of the six districts into which the territory covered by the Federation is divided. The executive board acts as a board of conciliation and arbitration (which are strongly recommended by the Federation), may levy assessments in case of emergency, must approve every strike and joint contract entered into by local unions, and between the annual conventions has full power to direct the workings of the Federation. The Western Federation of Miners officially indorses Socialism and advocates participation of labor organizations in politics with the view of securing to the working classes the ownership and operation of the means of production. It was founded May 15, 1893, largely as an outcome of the notorious Cœur d'Alène strike of 1892. In April, 1899, it again became involved in the Cœur d'Alène strike of that year, and in the later period of the strike controlled and directed it. During this conflict several persons were killed, martial law was declared, and certain county officers were impeached for failure to perform their duties in suppressing violence. A large number of miners were arrested by the temporary authorities and imprisoned in a stockade known as the bull pen. Persons desirous of securing work in the mines at that time were forced to obtain a permit, which was issued only after the applicant had signed a statement denying that he had participated in the riot of April 29, declaring his belief that it was incited and perpetrated by the miners' unions, expressing disapproval of the riot, renouncing membership in the miners' union, and pledging himself thereafter to obey the law. The Western Federation of Miners conducted in 1913 the Michigan copper strike, although the organization had gained no foothold there before the strike, and officially advised the copper miners against inaugurating a strike before establishing a solid organization. In 1913 there were 180 local unions affiliated with the Western Federation, with nearly 45,000 members. The unions were distributed through 22 States, chiefly in the Rocky Mountain and Pacific region and in Canada and Alaska. From 1896 to 1898 the organization was affiliated with the American Federation of Labor; from 1898 to 1905 with the American Labor Union; and in 1905 it took part in organizing the I. W. W., with which it remained connected until 1908. In 1911 it again became affiliated with the American Federation of Labor. The official organ is the *Miners' Magazine*, published monthly at Denver, Colo.

MINERS' ANÆMIA. See ANKYLOSTOMIASIS.

MINERS MILLS. A borough in Luzerne Co., Pa., about 3 miles northeast of Wilkes-Barre, on the Delaware and Hudson, the Central of New Jersey, and the Lehigh Valley railroads (Map: Pennsylvania, K 4). The surrounding region yields a fine grade of anthracite coal, and besides the mining interests, the town contains a flour mill, a brick plant, and ironworks. Pop., 1900, 2224; 1910, 3159.

MI'NERSVILLE. A borough in Schuylkill Co., Pa., 4 miles west of Pottsville, with which it is connected by an electric road, on the west branch of the Schuylkill River and on the Lehigh Valley, the Philadelphia and Reading, Pennsylvania, and the People's railroads (Map: Pennsylvania, J 6). It is in the anthracite coal region and has extensive coal-mining interests and underwear factories. Pop., 1900, 4815; 1910, 7240.

MINER'VA (Old Lat. *Menerva*, from root seen in Lat. *mens, memini, moneo*, Skt. *man-*, Gk. *μένος, menos*, spirit, strength. Minerva is thus the Thinker. The name Athena, Gk. *Ἀθήνη*, has not been satisfactorily explained. *Παλλάς, Pallas*, at first an epithet of the goddess, but later used as a name, has been connected with *παλλακή, pallakē*, a maiden). A Roman goddess identified with the Greek Athena. Though the two divinities have some resemblance, it will be best to treat them separately.

Greek. Athena, called also Pallas Athena, or, simply, Pallas, was a universally worshiped Hellenic divinity, and there is no satisfactory evidence of a foreign origin for her cult. In the earliest literature we find Athena already a fully developed personality, the favorite daughter of Zeus, wielder at times of his ægis (q.v.), and but little inferior to him in power. In general the goddess was warlike. Hence she was worshiped in the citadel of many towns, and her sacred images, the Palladia, which were often said to have fallen from heaven, were kept with great care, for their possession made the town impregnable. (See PALLADIUM.) She is not, however, connected with the mere lust of battle, but with military wisdom and patient strategy as well as with heroic prowess in actual conflict. Wisdom is, in fact, so prominent in the conception that later she became the patron of learning. Even in early times she is Ergane, the Worker, the goddess of crafts, especially the feminine occupations of spinning and weaving. This conception of her may have arisen from the custom of weaving for the statue of the goddess a peplus or mantle. Athena was also the goddess of smiths, and even of agriculture, so that at Athens the smiths and potters celebrated the *Chalkeia* as a joint festival of Hephæstus and Athena. As a battle goddess, she was worshiped at Athens as Athene Nike, bearing the spear and shield, and wearing the ægis, which is commonly adorned with the Gorgon's head, of petrifying power. As Ergane she carries the spindle; as Nike she carries a pomegranate. Sacred to her were also the snake and the owl, and especially the olive, which she was said to have given to Athens, her favorite city. In the Greek belief she was the pure virgin, but there are plain traces that this was not original.

Athens is for us the great centre of Athena worship, and here there were two ancient shrines, the Palladium in the lower town, the seat of an ancient court for the trial of involuntary homicide, and the Acropolis, where were the house of Erechtheus and the shrine of Athena Polias, Protectress of the City. Here was an ancient temple, burned by the Persians, but possibly rebuilt, at least in part. Close to its site was built, near the end of the fifth century, the somewhat complicated Erechtheum (q.v.), and earlier (437 B.C.) the Acropolis was crowned by the magnificent Parthenon (q.v.), containing the gold-ivory statue of the goddess by Phidias. In her honor were celebrated the Panathenæa (q.v.) and other smaller festivals, at some of which mystic rites were prominent. According to the common legend she was born from the head of Zeus, who produced her by his own power. Other versions told how Zeus had swallowed METIS (Wisdom) when pregnant by him of Athena. In the fullness of time Hephæstus or Prometheus or Hermes, to relieve the pains in the head of Zeus, split it with an axe, whereupon the goddess leaped forth full-armed—a scene frequent in the earlier vases. The nature of Athena is still a matter of dispute. To Roscher (see below) there is much in favor of the view that she is a goddess of the lightning. Farnell rejects this view, and finds mental and moral rather than physical elements predominant in the cult of the goddess from the beginning; he regards her rather as the director of the intellectual life of mankind, in all its varied aspects, peaceful and warlike both.

Bibliography. W. H. Roscher, "Athena," in *Lexikon der griechischen und römischen Mythologie*, vol. i (Leipzig, 1884–90); L. R. Farnell, *The Cults of the Greek States*, vol. i (Oxford, 1886); "Athena" in Pauly-Wissowa, *Real-Encyclopädie der classischen Altertumswissenschaft*, vol. i (Stuttgart, 1896); Jane E. Harrison, *Prolegomena to the Study of Greek Religion* (1903; 2d ed., Cambridge, 1908); O. Gruppe, *Griechische Mythologie und Religionsgeschichte* (2 vols., Munich, 1906); Arthur Fairbanks, *The Mythology of Greece and Rome* (New York, 1907); id., *Handbook of Greek Religion* (ib., 1910).

Roman. Minerva seems to be an old Italian goddess, patroness of handicrafts of all sorts, whose worship was also common in Etruria. She was not originally one of the leading Roman divinities, for her name is absent from the oldest religious calendars. When her worship was introduced is not known, but it was certainly early, for Minerva is one of the Capitoline triad, and was worshiped with Jupiter and Juno in the great temple of Jupiter Capitolinus, built by Tarquinius Priscus (see CAPITOL). She had also an ancient temple on the Aventine, which was the religious centre for the guilds of craftsmen, whose patron the goddess was. The festival of this temple was celebrated on March 19, the fifth day after the Ides (whence the name of the festival, Quinquatrus, or Quinquatria), and seems to have formed originally part of a festival of Mars. In time Minerva herself became patroness too of the arts of war. This festival was chiefly celebrated by the guilds, including physicians (whence was worshiped a Minerva Medica), dramatic poets, and actors, and was of a distinctly popular character. (For Minerva as patroness of learning, see ATHENÆUM.) On the Capitol Minerva appears in her Greek aspect as protector of the city, but this and her worship as a goddess of battle or victory seem due entirely to foreign influence. In the later Republic and the Empire the Greek conception of Athena almost completely supplanted the earlier Italian belief. Thus the Palladium (q.v.) kept at Rome in the temple of Vesta was believed to be an image of Minerva. Consult: W. W. Fowler, *Roman Festivals* (London, 1899); G. Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912); C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911).

MINERVA MEDICA, TEMPLE OF. The name erroneously given in the seventeenth century to the ruins of a decagonal nymphæum on the Esquiline in Rome, formerly belonging to the Licinian Gardens, or, according to some authorities, to the Thermæ of Gallienus (c.250 A.D.). The name was wrongly based on that of the famous statue in the Vatican Museum miscalled Minerva Medica, which was not found on the Esquiline, but near the church of Santa Maria sopra Minerva. The 10 sides of the nymphæum, once adorned with mosaics and porphyry, are occupied on the lower story by a door and nine niches, with 10 windows above them. It was covered by a dome which was destroyed in 1828 and which was the earliest example of a dome above a drum of windows with buttresses between. When the ruins were excavated in the sixteenth century numbers of statues and architectural marbles were recovered.

MINERVA PRESS. The name of a London printing house, from which issued, late in the

eighteenth and early in the nineteenth century, an immense number of sentimental and trashy novels.

MINERVINO MURGE, mē′nĕr-vē′nō mōōr′jā. A walled town in the Province of Bari delle Puglie, Italy, situated 25 miles southwest of Barletta (Map: Italy, F 4). It produces fruit, vegetables, and oil. There are also large quarries and limekilns. Pop., 1901, 17,353; 1911, 19,325.

MINES, Bureau of. A bureau of mining, metallurgy, and mineral technology in the Department of the Interior of the United States whose general function is to conduct, in the public interest, inquiries and scientific and technological investigations concerning mining, and the preparation, treatment, and utilization of mineral substances, with a view to improving health conditions and increasing safety, efficiency, economic development, and the conservation of natural resources, as well as to inquire into the economic conditions affecting these industries, and to disseminate general information having to do with mines and minerals. This bureau was established by Act of Congress, approved May 16, 1910, and became effective on July 1 the same year. The organic act establishing the bureau provided that the Secretary of the Interior should transfer to the Bureau of Mines from the United States Geological Survey the analyzing and testing of coals and other mineral fuel substances, and the investigations as to the cause of mine explosions. The various engineers, chemists, and other employees, also the equipment of the Geological Survey used for this work, were accordingly placed under the direction of the new bureau. It proceeded to carry on a number of important investigations having to do with such subjects as coal-mine explosions, explosives used in mining, especially those which, if properly used, will not ignite coal dust or coal dust and fire damp in small percentages; such explosives are tested and if they meet the rigid specifications are called "permissible" explosives for use in dusty and gaseous coal mines. Other investigations are: the use of electricity in mining, and the testing and approval of safety lamps, mine rescue, and first-aid apparatus. An important function of the bureau's work is the gathering of coal samples in mines and from shipments of coal for use by the navy, the army, the Panama Canal, and for the government buildings. The samples are analyzed, and larger shipments are tested in boiler plants and on vessels belonging to the government. Samples of coal gathered by geologists of the United States Geological Survey in their investigations are analyzed in the bureau's laboratory. The results of all coals sampled and analyzed are published from time to time in bulletins. The scope and purpose of the bureau were widened in a subsequent organic Act, approved Feb. 25, 1913, to include quarrying, metal mining, and metallurgical investigations and mineral fuels; and its work has since been conducted with vigor and valuable researches and publications have followed. The Bureau of Mines is under a director, Joseph A. Holmes, and includes, besides the administrative division, as organized in 1915, five technical divisions: mining, metallurgy, mineral technology, fuels (other than petroleum), and petroleum, including natural gas. The chief technical headquarters is at Pittsburgh, Pa., which is the largest coal-mining and steel-making centre. Extensive testing is done here of mining appliances especially with reference to safety, and an experimental coal mine, chiefly for large explosion tests, is maintained by the bureau at Bruceton, 12 miles southwest of Pittsburgh. At this headquarters, chemical research as well as routine work is carried on. An analytical laboratory for testing fuels for government uses is maintained at Washington, D. C. A chemical laboratory is located at Denver for research work in connection with complex ores and rare metals like radium. Also in coöperation with a philanthropic institute, radium ores are concentrated and radium bromide produced for use in hospitals. At Salt Lake City, Utah, a coöperative laboratory is maintained for smelting and for electrometallurgical investigations. In San Francisco there are maintained laboratories for the investigation of smelter fumes and of methods of their prevention; also here, as well as in Pittsburgh, there are laboratories for petroleum and natural-gas investigations. These various investigations have already produced many valuable suggestions and results. Accounts, together with accident statistical information, have been published from time to time. Up to the end of the fiscal year 1914, 78 technical papers, 15 miner's circulars, and 82 bulletins had been published. Inspection of coal mines on government lands and in Oklahoma on "segregated" Indian lands, also in Alaska, is a function of the bureau. One of the most important parts of the bureau's work concerns the health and safety of workers in metallurgical and mineral concentration plants as well as in mines and quarries; however, as yet, in accordance with the terms of the appropriations, the chief safety and health investigations have been in coal mines. For the rescue of miners who may be entrapped by explosions or fires, mine-rescue corps under the leadership of district mining engineers have been maintained. While these men have assisted in many disasters, their chief function is to train miners in the use of oxygen-breathing apparatus and in first-aid methods. In its mine-rescue work and training work there are maintained mine safety cars equipped with apparatus for mine-rescue work and available to be sent to the scene of any mine accident but which normally travel in and around the principal mining districts, to give instruction to employees at each mine visited. In 1914 eight of such cars were in service, six in the principal coal fields, one in the Lake Superior iron and copper district, and one in the Rocky Mountain districts, while in Pittsburgh, Pa., and Birmingham, Ala., mine-rescue motor trucks able to transport nine rescue men with artificial breathing apparatus and first-aid supplies were available in case of disaster. The mine-rescue work of the bureau is done in coöperation with State officials and with mine operators. In addition to the cars and rescue trucks the bureau maintains six mine safety stations located respectively at Pittsburgh, Pa., Knoxville, Tenn., Birmingham, Ala., Urbana, Ill., McAlester, Okla., and Seattle, Wash., primarily for the purpose of training and instructing miners sent to these stations by operators or who come of their own initiative. Much suffering has been saved through the organization of first-aid crews. See Mine Accidents.

MINES AND MINING, in Law. The law relating to mines in the United States has been almost wholly developed within the last 65

years, or since the opening of the gold fields of California in 1849–50. By the common law of England all mines of gold or silver, wherever found, belong not to the owner of the land, but to the sovereign as an incident of the royal prerogative. There is some doubt as to whether this doctrine was ever generally adopted in the United States. It was, however, undoubtedly recognized by several Eastern States immediately after the Revolution, and in New York a statute, still in force, expressly reserves to the State the right to mines of gold and silver. In general, however, the government of the United States was considered to reserve all mineral rights in public lands conveyed or given to citizens, unless such rights were expressly granted. For a time the government leased mineral lands on royalties or fixed rents, but, owing to the great difficulty of ascertaining and collecting the amounts due, this policy was finally abandoned, and rights to take minerals were granted outright.

The law was in this condition when gold was discovered in California, and thousands of persons, many of them without previous experience in mining and with no knowledge of mining rights, rushed there and discovered and opened up mines. To avoid the frequent shedding of blood and other disagreeable consequences of disputes over the extent of each other's rights, it became the custom for the miners in a new district to meet and pass rules and regulations defining the rights of discoverers and miners, and these were enforced by committees appointed for the purpose. Subsequently, when courts were established in California, they adopted these rules and regulations, which had become so recognized and fixed in mining communities as to become in effect their common law. The claims of the miners were protected on the fiction that they had originally obtained a license from the government, and if they followed the rules of their particular districts they were held to have a property right in their mines, or claims, as they were called. These rights or claims could be conveyed, would descend to the heirs of the holder, and were in every way treated as real property. In July, 1866, Congress passed a law providing that title to public mineral lands might be acquired by payment of a small fee and by complying with certain prescribed formalities. This Act was superseded by the Act of 1873 (Rev. Stat., Tit. xxxii, c. 6), which substantially incorporated the provisions of the former Act and supplemented them with others suggested by the new development in mining practice, and which is the basis of the present mining law.

The Act of 1873 also provided for the judicial recognition of the rules and regulations then prevalent, and such as might thereafter obtain recognition in mining districts, where they were not contrary to its own provisions or the laws of the States in which such districts were situated. One of the important provisions of the last Act was to prescribe the maximum limits of claims. The extent of a lode claim, i.e., one where the ore runs in a well-defined vein, is fixed at 300 feet on either side of the vein by 1500 feet in length; and placer claims, i.e., where the ore is loosely mingled with the surface earth, are not to exceed 20 acres to one individual, or 160 acres to an association of individuals. The areas of both lode and placer claims may be changed by the statutes of the States in which they are situated or by the rules of the mining district, provided they do not exceed the above-defined limits. The owner of a claim may follow a well-defined vein of mineral for 3000 feet from the opening of the shaft in any direction, and he may follow a vein the general course of which is downward through its "dips" and variations indefinitely.

The common-law rule that a man owns everything directly beneath the surface of his land is, therefore, not followed in the modern law relating to mines. It often happens that two lodes intersect, and in such a case the one who first opened his mine is entitled to the ore at the point of intersection; but each is entitled to follow his lode farther, and each has an easement or right to cross the tunnel of the other at that point in the proper working of his mine. Owing to the great difficulty in ascertaining whether a person in following his own vein is or is not trespassing on another's lode, any owner of lands who has reasonable cause to believe that another is doing so may obtain from a court of equity an "order of inspection" to determine whether the latter is encroaching on the land of the complainant or not.

Rights to water, which is so essential in mining operations, vary in different jurisdictions; but in general the one who first appropriates the waters of a stream for his use in mining is conceded the right to use all that is reasonably necessary in his operations. However, when some one else locates on the same stream the first person can continue to take only the amount he was using when the second person located his claim. The owner of a mine must properly support the earth surrounding his tunnels, and is liable for any damage caused to the lands of others by settling of the earth if due to his negligence in this respect. The rules and customs of the miners which were given the effect of law by the Statute of 1873, and those which have since come into existence, are too numerous and complicated to be set forth in the scope of this article. However, it may be said that in the present state of the law the courts, in deciding a case involving mining law, take into consideration, in the order mentioned, the statutes of the United States, the laws of the State in which the property in question is situated, and the rules and customs above referred to.

Any citizen of the United States, or a person who has declared his intention to become such, may locate and obtain a patent for a mining claim on public lands. Before a person can acquire any rights he must have actually discovered the presence of minerals. The first step thereafter is to make a "location" on the land claimed, i.e., to perform certain acts which are deemed to constitute sufficient evidence of an intention to claim the benefits of the discovery. The United States statutes provide that a claim must be "distinctly marked on the ground so that its boundaries can be readily traced." This is usually done by setting up boundary monuments, such as posts or stones, at the four corners of the claim. In most States the locator, as the prospector is called, is required to post a written notice of his claim on some object on the land. This notice consists of a description of the land thus appropriated and a declaration of his intention to occupy it for mining purposes. Such notice of claim must also be filed with a recording officer, usually the register of deeds of the county. After a miner has located his claim

in the above manner he must continue his mining operations or he will be deemed to have forfeited it. The labor may consist in actual mining, or in improvements in the mine for preservation or increased convenience in working it. When a claim is forfeited by a failure to perform labor of the required value it is open to relocation by any one. However, under this statute the claim is not forfeited until the expiration of a year from the time operations ceased. A claim may also be lost by abandonment, which consists in leaving a claim with an intention not to return and work it again.

Where a mining prospector complies with all the formalities required by law to obtain a location he has a good title against every one except the United States. In order to complete his title and make it a matter of record, the locator may obtain a patent, i.e., a grant, of the claim from the Federal government, by having a survey and an abstract of his possessory title made and filing them in the United States Land Office, together with a formal application for a patent and a certificate to the effect that he has expended at least $500 on the claim, either in improving or working it. The application consists of an affidavit to the effect that he has complied with all local mining customs and regulations as well as the statutory requirements to obtain a good possessory title. One copy of this application must be posted on the claim and a notice thereof must be published in the nearest newspaper.

The rules of law in regard to the ownership, conveyance, and descent of real property are, in general, applicable to mining property. A tenant for life or years of mineral lands is entitled, as an incident of his tenancy, to work open mines thereon, but cannot, unless this right is expressly given, open new mines or revive abandoned mines without becoming liable for waste (q.v.). See LAND; REAL PROPERTY; WATER RIGHTS.

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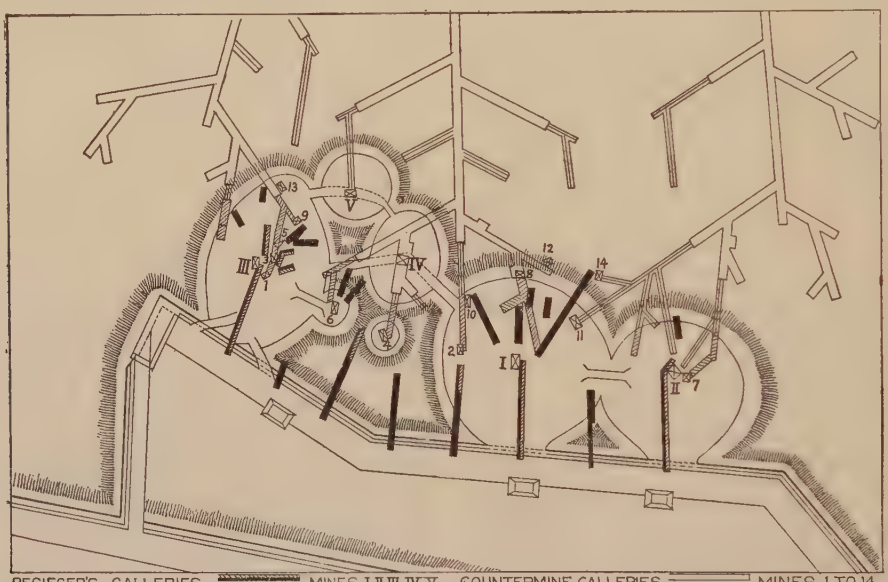
MINES AND MINING, MILITARY. The term "military mining" is used in two senses. The first covers the placing and explosion of charges of explosive underground with a view to destroying men, matériel, and communications. It includes the ordinary use of mines as one of the obstacles to the approach of an attacking force. The other and more specific use of the term is to denote one of the stages in a stubborn siege and in trench warfare. In the discussion of siege and siege works (q.v.) it is shown that when the attacking or besieging troops are no longer able to advance in the open, progress is made by approaches and parallels, in the hope that, if the besieged is not first starved, the besieger may advance close enough under the protection of his own trenches for the delivery of an overground assault. Occasionally, however, the relative force and skill of the combatants are such that the besieged may bring the approach of the besieger by surface trenches to a standstill. This is accomplished by his heavier gunfire or his greater skill, supplemented probably by underground tunnels and countermines which so threaten an overland advance as to make it impracticable. When thus checked the attacker must resort to military mining if he wishes to advance further.

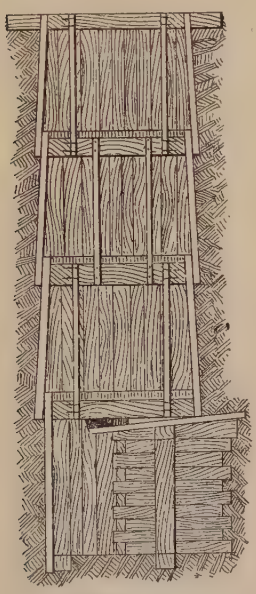


MINING OPERATIONS AT GRAUDENZ, 1862.

From the last advanced open position he has been able to construct the besieger proceeds underground by a system of shafts and galleries. These vary in size. In general the start is made with large galleries gradually ramifying into

smaller but more numerous galleries whose heads are close together. The principal types recognized in the textbooks are *great* galleries with a height of 6 feet and width of 7 feet, *common* galleries with the same height and half the width, *half* galleries with a height of 4½ feet and width of 3 feet, and *branches* with a height of 3½ feet and width of 2½ feet. The accompanying cut indicates the methods in which these branches develop. The shafts and galleries are usually lined with board casings 2 to 4 inches thick, or with heavy frames placed at intervals holding in position thin sheeting. For the work of excavating special tools are provided, shorter than those used aboveground. Provision is made at frequent intervals for ventilating the tunnels sufficiently to permit the miners to work. Passage from one level to another is by shafts or by inclined slopes. Great care is taken in the preparation of a map, corrected to date and showing the position of the various tunnels and branches, and their relations to each other, both in plan and in elevation. A similar system of tunnels is constructed by the besieged. As the two systems approach each other it becomes the object of each combatant to destroy the system of the other. In doing this the besieger is also normally desirous of forming a crater reaching to the ground above which he can occupy with his troops, thus obtaining new points of vantage on the surface. To prevent the formation of such positions the besieged endeavors to effect his explosions without breaking the surface of the ground.

The tendency in surface warfare is also towards a greater use of trenches both for positions and communications. When the trenches approach each other closely resort is naturally had to mining as one of the means of attack. Small branch galleries are run forward well below the surface and mines placed and exploded under important points of the enemy's line, as magazines, batteries, and intersection of crossing trenches.



SHAFT LINING.

The explosives used in mines and mining have been gunpowder, guncotton, dynamite, and mixtures of dynamite with other high explosives. The quantity of explosive to be used depends upon the result desired. A *common* mine is one in which the crater formed has a diameter at the surface approximately twice the depth. Mines with larger charges of powder than will produce this result are known as *overcharged* mines; with less, as *undercharged* mines. When given a charge so small that no crater is produced on the surface they are called *camouflets*. To produce a common mine the charge varies considerably with the nature of the soil. The general rule for them with gunpowder in ordinary earth is that the charge must be equal in pounds to one-tenth the cube of its distance in feet below the surface.

Mining operations were conducted upon a large scale at the siege of Sebastopol in 1854 and 1855, where the Russians, under the lead of the accomplished engineer, General Todleben, were able to withstand the allies a period of 349 days. Mining was carried on in the sieges of Vicksburg and Petersburg in the Civil War, and in that of Port Arthur in the Russo-Japanese War. Military mining has played an important part in past wars at critical times, and it is probable that in a form adapted to the changing conditions it will always be a big factor in large and protracted land wars. The subject of siege works and military mining is treated in Mercur, *Attack of Fortified Places* (New York, 1894), in the Chatham *Manuals*, especially part iv (London, 1883), and in *Engineer Field Manual*, United States War Department. For submarine mines and torpedo defenses, see MINE, SUBMARINE; TORPEDO; TRENCH, MILITARY.

MINETTE, mē'nĕt' (Fr., dim. of *mine*, mine, whence Rhenish Ger. *Minette*, iron ore). An igneous rock of granular or porphyritic texture, composed essentially of orthoclase feldspar and biotite. In contrast with the granites, syenites, and diorites, to which it is related, it is rich in ferromagnesian minerals, and hence has a darker color. Minettes generally occur in dikes, and are quite susceptible to weathering agencies.

MINE WORKERS OF AMERICA, THE UNITED. The largest American labor union, whose declared object is "to unite mine employees that produce or handle coal or coke in or around the mines, and ameliorate their condition by means of conciliation, arbitration, or strikes." The officers consist of a president, vice president, and secretary treasurer, who, together with one delegate from each of the 29 districts into which the jurisdiction of the United Mine Workers is divided, constitute the National Executive Board, which has the power to levy assessments and to order general strikes by a two-thirds vote. The government of the union is thus highly centralized. In organization the United Mine Workers is an industrial union, aiming to unite not only miners, but all skilled and unskilled laborers working about coal mines, except mine managers and top bosses. This policy of industrial organization has brought the union into conflicts with the unions of the stationary firemen and of the blacksmiths. In operation the United Mine Workers is a typical new union of the aggressive type. It maintains no extensive system of fraternal benefits, but devotes the greater part of its revenue to the support of strikes and the organization of new unions. Thus, out of the total expenditures of $2,102,261 in 1913, $1,621,942 were appropriated to aid and $290,764 to salaries and expenses of officers and organizers. The control of local strikes rests partly with the national officers. Any local union may strike provided it obtains the consent of the district officers and the national president, but in case either disapprove, an appeal for the permission "to strike may be made to the executive board. Any local union striking in violation of the above provisions shall not be sustained or recog-

nized by the national officers." This seems to constitute the only penalty for unauthorized strikes. In the bituminous districts of Illinois, Indiana, Ohio, and Pennsylvania strikes have been practically eliminated by the annual joint conference, or collective bargaining, between the miners and operatives, in which a scale of prices for the following year is adopted and the settlement of further differences provided for by local boards of arbitration. The United Mine Workers was organized Jan. 25, 1890, but its membership decreased rather than increased until the great bituminous coal strike of 1897, during which year the average membership was only 9731. Since that time the membership has increased by leaps and bounds, and in 1905 the national union had an average paid-up membership of 264,950, which increased to 377,682 in 1913. For December, 1913, the paid-up membership was 415,142, distributed among 29 districts and about 3000 local unions. The greatest gains were coincident with the anthracite strikes of 1900 and 1902, the latter of which, lasting more than five months and involving 147,000 workmen, is perhaps the most important strike in American history. The official journal is *The United Mine Worker,* published weekly at Indianapolis. Reports of the biennial conventions, published at Indianapolis, offer much valuable information relating to the organization. See TRADE-UNIONS.

MINGHETTI, mĭn-gĕt'tē, MARCO (1818–86). An Italian writer and statesman. He was born at Bologna, Nov. 8, 1818, of a wealthy family, and after a university course in political science made a study of the institutions of France, Germany, and Great Britain. On his return to Italy he published an essay on the great commercial advantages of free trade, as existing in England, and espoused with warmth the economic views of Richard Cobden, for the assimilation of which he had been prepared by a knowledge of the teachings of the Tuscan economist Bandini. In 1846 Minghetti began his political career by starting at Bologna a journal of liberal tendencies, *Il Felsineo;* by 1847 he had made such a name for himself that he was called to Rome by Pius IX to become a member of the *Consulta delle Finanze,* and in 1848 he became Minister of Public Works. After the papal change of front, however, Minghetti withdrew from office and joined the army of Charles Albert in Lombardy, where he was warmly received by the King and appointed to the royal staff with the rank of captain. After the battle of Goito he was made a major and distinguished himself in the engagement of Custozza (July 25, 1848). In the autumn of the same year Minghetti was invited to Rome by his friend Count Rossi as a member of the new constitutional ministry. He arrived the day of Rossi's assassination, and after refusing the Pope's request that he take the place of the murdered Minister he returned to the Piedmontese army. On the disastrous conclusion of the war Minghetti resumed his study of political economy and gained the confidence of Cavour, by whom he was consulted during the conferences of Paris. In 1859 he became Secretary General in the Ministry of Foreign Affairs, but resigned with Cavour upon the conclusion of the armistice of Villafranca. Minghetti became Minister of the Interior under Cavour in 1860 and after the death of Cavour held the portfolios of the Interior under Ricasoli and of Finance under Farini. In March, 1863, he became Prime Minister. He left office in 1864. He went as Ambassador to London in 1868 and was subsequently for a short time at the head of the agricultural and commercial department in the Menabrea ministry (1869). He was Ambassador to Vienna in 1870–73. From 1873 to 1876 he was again at the head of the cabinet, first as Minister of Finance and later as Minister of Foreign Affairs. He spent the last years of his life in study and partial retirement and died at Rome, Dec. 10, 1886. Among his chief writings are: *Del' economia pubblica, etc.* (1859); *Opuscoli letterari ed economici* (1872); *Stato e chiesa* (1878). His speeches in Parliament (Discorsi parlamentari) were published in Rome in 1888–90. He was also a student of the fine arts, and, besides lecturing on Raphael and Dante, he produced a work, *Le donne italiane nelle belle arti al secolo XV e XVI* (1877), and a biography of Raphael (1885). His autobiography, *I miei ricordi* (Turin, 1888), appeared after his death.

MINGO (mĭn'gō) **JUNCTION.** A city in Jefferson Co., Ohio, about 12 miles northeast of Urbana, on the Pennsylvania Company, the Pittsburgh, Cincinnati, Chicago, and St. Louis, and the Wheeling and Lake Erie railroads (Map: Ohio, J 5). The Carnegie steel works comprise the only manufacturing plant. Farming, dairying, and fruit growing are carried on, and some coal is found in the vicinity. The city owns the water works. Pop., 1900, 2954; 1910, 4049.

MINGRE'LIA. A former independent feudal state of the Caucasus, bordering on the Black Sea, now included in the Russian Government of Kutais (Map: Russia, F 6). It was a vassal state of Georgia until 1414, when it became independent under its own princes, although tributary to Turkey and Persia. Russia obtained control over it in 1803, but the internal administration was left in the hands of the native chiefs until 1867, when, as a result of a series of peasant uprisings begun in 1857, it was finally annexed by Russia. The inhabitants are mostly Mingrelians, closely allied to the Georgians. Mingrelia is the ancient Colchis.

MINGRE'LIANS. A tribe of the Kutais region, numbering some 250,000 and belonging to the Georgian group of peoples of the Caucasus. (See MINGRELIA.) In stature they are above the average, and, like the Georgians proper, many of them are of great physical beauty. The Mingrelian language varies considerably from the Georgian prototype. Of the character of the Mingrelians many investigators have entertained no high opinions, setting them down as lazy and unprogressive. The Mingrelians, as are the other Georgians, are more or less Christian. They have a folk literature, consisting of legends, songs, etc., the people being fond of music, the dance, etc. Consult: Telfer, *The Crimea and Transcaucasia* (London, 1876); Chantre, *Recherches anthropologiques dans le Caucase* (Paris, 1885–87); Erckert, *Der Kaukasus und seine Völker* (Leipzig, 1887); Bryce, *Transcaucasia and Ararat* (London, 1897); and, for their place among the Caucasian people, A. Dirr, "Anthropologische und ethnographische Uebersicht über die Völker des Kaukasus," in *Petermann's Mitteilungen,* vol. lviii (Gotha, 1912). See GEORGIANS.

MINHO, mē'nyō. A river of the Iberian Peninsula. See MIÑO.

MINHO. A province of Portugal. See ENTRE DOURO E MINHO.

MINIATURE PAINTING. Painting in small dimension and of delicate workmanship, usually in water color on vellum or ivory. The term is derived from *minium*, Latin for red lead, a pigment used in illuminating manuscripts, and it was first applied to the pictures which illustrated manuscripts. (See ILLUMINATED MANUSCRIPTS.) Portrait miniatures appeared in devotional manuscripts as early as the late thirteenth century, one of the earliest being a likeness of St. Louis in the *Credo* of Sire de Joinville (c.1287). They attained their highest excellence in the Netherlands and northern France during the fifteenth and early sixteenth centuries. With the introduction of printing, miniatures in manuscripts disappeared; but the transition to the miniature in the modern sense had already been accomplished. This latter is usually a single portrait, oval in shape and from 2 to 4 inches high. Early German and Netherlandish painters sometimes painted them in oil on copper, but they were most frequently executed in water color on vellum, sometimes on chicken skin or cardboard. The use of ivory for this purpose began in the late seventeenth century, but did not become general until the eighteenth. Its introduction changed the character of miniature painting, as more transparent and delicate colors could thus be achieved. This adapted the art especially to the portrayal of flesh tints and other feminine charms, with the result that women replaced men as the principal subjects of miniatures. Miniatures in enamel became popular from about the middle of the seventeenth century, and the subsequent practice of presenting snuff-boxes, cardcases, and other favors greatly promoted the form of the art, particularly in France. During the eighteenth century the increasing demand for tiny miniatures for use in lockets, bracelets, and the like, led to the practice of stippling, in which the color was applied in minute dots, with fine technical effects, but to the detriment of character and sacrifice of general effect.

History. The great charm of miniature painting consists in the intimate view it affords of the sitters, often persons of historical importance. Princes and rulers have always patronized the art, and it has consequently flourished in the national capitals of England, France, and other north European countries. One of the earliest and greatest representatives of the art was Hans Holbein the Younger (1497–1543), whose miniatures have the same qualities as his larger portraits and contain a remarkable grasp of character, with breadth of treatment, impeccable detail, and clear, strong color. His influence is especially evident in the clear and precise art of his follower, Nicholas Hilliard (1537–1619), and in the more richly colored miniatures of the latter's son Lawrence. Isaac Oliver's (c.1567–1617) art is more strongly characterized and both he and his son Peter gave greater roundness to the figures. The greatest master of the seventeenth century was Samuel Cooper (1609–72), who united Van Dyck's elegance with breadth and dignity, in his remarkable portraits of the men of the Commonwealth. The art declined during the early eighteenth century, but again reached a climax in the work of Richard Cosway (1741–1821), the most popular of English miniaturists, whose gently idealized portraits of women are painted with consummate mastery of delicate color. Of his followers, George Engleheart's art was more virile than his master's; Andrew Plimer was rather insipid, while John Smart united power and refinement. During the nineteenth century, concomitant with a general decline of the art, the so-called large miniature came into vogue, measuring as much as 50 centimeters in height, and characterized by breadth of treatment rather than finish, as may be seen in the works of Andrew Robertson and Sir William Ross. The invention of photography had a disastrous effect on miniature painting, diminishing both the demand for it and the necessity of painting directly from the sitter. The end of the nineteenth century witnessed a general revival.

In France the art was as prolific and important, especially during the eighteenth century, as in England. It was introduced from Flanders by Jean Clouet (died 1540), whose work was continued by his son François and others; but few of these early miniatures can be identified with certainty. The greatest French miniaturist of the seventeenth century was Jean Petitot (1617–91), the first successfully to use enamel. He adopted the style of Van Dyck and invented several new colors, particularly for rendering the flesh tints. His gifted son, Jean Petitot, and numerous followers continued his traditions, which long dominated enamel painting. The most prominent of the stipple engravers was Jean Baptiste Massé (1687–1767). Pierre Adolphe Hall (1739–93), a Swede by birth, excelled all contemporary artists in an art as delicate as it was free and powerful. Many distinguished painters of the eighteenth century practiced also in miniature; such as Largillière, Nattier, and especially Fragonard, who, unhampered by tradition, painted miniatures in a style similar to his canvases. The most popular miniaturists of the Napoleonic era were Dumont, Isabey, and especially J. B. Augustin.

In Germany the art was practiced during the sixteenth century by many early painters, like Lucas Cranach the elder, Ludwig tom Ring, and others. Rosalba Carriera (1675–1757), the talented Venetian, painted miniatures not unlike her pastels, and possessing a certain spiritual quality. Both she and her pupil, Felicitas Sartori Hoffmann, who settled at Dresden, exercised a wide influence upon the German school. This school culminated in the work of Heinrich Friedrich Füger (1751–1818), who practiced chiefly at Vienna, which early in the nineteenth century was an important centre of miniature painting. In the Netherlands, Scandinavia, and Russia the art was also practiced with varying success.

In the United States most of the early painters also attempted miniatures, notably Copley, Gilbert Stuart, C. W. Peale and others of his family, and John Trumbull. But the most important miniaturist of the early period was Edward Greene Malbone (1777–1807), who combined good drawing with an innate feeling for beauty and grace. The general decline of the art during the nineteenth century was followed by an important revival in the late nineties. The American Society of Miniature Painters, founded in 1899, holds annual exhibitions in New York. Its president, William J. Baer, and Laura C. Hills, pioneers in the art, occupy

places of the first rank. Other important artists are Lucia Fairchild Fuller, Martha S. Baker, Florence Mackubin, Virginia Reynolds, L. A. Josephi, W. J. Whitmore and J. W. von Rehling-Quistgaard. American miniature painting is characterized by animation, truth to nature, and the use of clear, bright color.

The most important collections of miniatures are in private possession. One of the finest is that of the late J. P. Morgan (Metropolitan Museum of Art, New York), with examples of nearly all of the prominent English and French miniaturists. Other notable collections belong to the King of England, the German Emperor, the Czar of Russia, King of Sweden, Queen of Holland, and other sovereigns. Among the museums owning good collections are the University Galleries, Oxford; the Wallace collection, London; the Louvre; the Rijks Museum, Amsterdam; and the museums of Dresden and Vienna. There are a number of important private collections in England.

Bibliography. J. L. Propert, *History of Miniature Art* (2 vols., London, 1887), is still valuable from the collector's point of view. Another important work is J. J. Foster, *Miniature Painters, British and Foreign* (2 vols., New York, 1903), and more recent still, Dudley Heath, *Miniatures* (London, 1908), containing a bibliography, and Lemberger, *Portrait Miniatures of Five Centuries* (ib., n. d.). The chief English authority on miniatures is G. C. Williamson, among whose works we cite the brief *Portrait Miniatures from the Time of Holbein* (London, 1897); *Andrew and Nathaniel Plimer, Miniature Painters, their Lives and their Works* (ib., 1903); *History of Painting in Miniature* (2 vols., ib., 1904); *Catalogue of the Collection of Miniatures of J. P. Morgan* (4 vols., ib., 1906), a monumental work. J. W. Bradley, *Dictionary of Miniaturists, Illuminators, Calligraphists, and Copyists* (3 vols., ib., 1887–89), is still valuable as a book of reference; also Ernest Lemberger, *Meisterminiaturen aus fünf Jahrhunderten* (Stuttgart, 1911); F. R. Martin, *Miniature Painting and Painters of Persia, India, and Turkey from the Eighth to the Eighteenth Century* (2 vols., London, 1912); Camille Faust, *Les miniatures de l'Empire et de la Restauration* (Paris, 1913); Fernand de Mély, *Les primitifs et leurs signatures*, vol. i (ib., 1913). See also the bibliography of ILLUMINATED MANUSCRIPTS.

MINIÉ, mē'nyā', CLAUDE ETIENNE (1814–79). A French soldier, ordnance expert, and inventor. He was born in Paris, entered the army as a volunteer, and served in Algeria during several campaigns. He became captain in 1849 and superintendent of the school of ordnance at Vincennes in 1852. In 1858 he was employed by the Egyptian government to superintend a manufactory of arms and a school of gunnery at Cairo. He invented the Minié rifle, which was brought out in 1849 and adopted by the French government, and is especially noteworthy in that it was the first practical introduction of the principle of expansion in the manufacture of projectiles and gave a precision and range previously unknown. The Minié bullet was a conical projectile of lead, hollowed out at the base. When fired the base of the ball expanded, to take the rifling. See SMALL ARMS.

MIN'IM, IN MUSIC. See MENSURABLE MUSIC.

MINIMA. See MAXIMA AND MINIMA.

MIN'IMITES (Lat. *fratres minimi*, least brethren, so called, in token of still greater humility, by contrast with the *fratres minores*, lesser brethren, the original name of the Franciscans). A Roman Catholic religious order, founded by St. Francis of Paola (q.v.). Devout hermits began to gather round him as early as 1435, and in 1444 a convent was founded at Paterno. The order received papal confirmation in 1474. It spread first into France, when the founder was summoned thither by Louis XI. In Paris they were commonly known as *Bons Hommes*, from the popular name of an older community to whose house at Vincennes they succeeded; and in Spain, to which they next spread, they got the name of Fathers of Victory, from the fact that the recovery of Malaga from the Moors was ascribed to their prayers. The Emperor Maximilian invited them to Germany in 1497. Their first definite rule was not drawn up by the founder until 1493; it was exceedingly austere, forbidding the use not only of meat, but of all animal products, such as butter, eggs, cheese, and milk. The order at one time numbered 450 houses, but later fell into decay and is now represented by 17 convents in Italy, Sicily, and Sardinia, and one in Spain. The superior of a convent has the title of corrector, the head of the whole order being the corrector general. Francis also founded an order for women which never had more than 14 convents and is now almost extinct, and a third order (see TERTIARY) for persons living in the world. Consult D'Attichy, *Histoire générale de l'ordre sacré de Minimes* (2 vols., Paris, 1624), and Heinbucher, *Die Orden und Kongregationen der katholischen Kirche* (Paderborn, 1907).

MIN'IMUM DEVIATION, ANGLE OF. See LIGHT.

MINIMUM WAGE. A term employed to designate the lowest level of earnings affording for a given class of laborers and those naturally dependent upon them means of existence adequate to maintenance in full physical efficiency and social decency. This minimum is difficult to define precisely, and varies from place to place, according to cost of food, housing, fuel, etc. In attempting to define the minimum, recourse is usually had to investigations of the physiologists as to the quantity and variety of food necessary to maintain a worker or a workingman's family in normal health. The results of such investigations, translated into money terms by means of tables of retail prices, supplemented by local studies of house rents, clothing costs, etc., afford the basal figures in minimum wage computations. The minimum thus defined for a normal working-class family in American cities varied from somewhat under $1500 to $1800 or a trifle more, according to prices prevailing in 1921.

The minimum wage movement is a concerted effort of workers and social reformers to force wages in the less well-paid trades to a level corresponding with the social minimum as above described. Organized labor in its more successful forms has established a level of wages well above such a minimum. Unskilled laborers often fall far below it, and especially is this true of immigrant labor and the labor of women and children. The discrepancy between wages and a decent minimum of subsistence is most shocking in the case of the sweated trades, where whole populations are sometimes kept in a condition worse than slavery, slowly succumb-

ing to malnutrition and its accompanying maladies.

The first state to undertake seriously to apply political means to the eradication of underpayment was the Australian colony of Victoria. By a law of 1896 boards were constituted in six trades with authority to fix minimum wages. The operation of the law was so satisfactory that it was later extended gradually in scope until in 1915 it covered 141 trades, employing over 150,000 workmen. The success of the Victoria experiment aroused great interest, after 1905, in the United States and Great Britain. Before the close of 1921 twelve American Commonwealths had enacted minimum wage laws. Of these Massachusetts and Nebraska provide for commissions with power to investigate and report on what would be an appropriate minimum wage in specified industries, but have made no provision for forcing employers to pay such wages. California, Colorado, Minnesota, Oregon, Washington and Wisconsin provide for commissions with power, after investigation, to fix rates legally binding upon employers. The State of Utah fixes a legal minimum by statute and makes it a penal offense for employers to pay less than the minimum. All American minimum wage laws, for constitutional reasons, are limited in their application to women and minors. Great Britain, by Act of 1909, established trade boards with power to fix minimum wages in the trades of chain making, machine-made lace finishing, box making and tailoring—notoriously sweated trades. After the great coal strike of 1911 an Act was passed setting up district wage boards in the coal-mining industry.

While the ideal of the minimum wage movement is the establishment of a living minimum in every trade, the practice of trade boards and commissions is much more conservative. Such boards and commissions content themselves with fixing such wages as are practicable, i.e., wages that can be paid without destroying an industry or driving it to another jurisdiction. Thus the minimum is rarely above the level already established by the better-paying establishments. In unorganized trades wages for similar labor vary widely, the establishments ill equipped with machinery or inefficiently managed making up their competitive disadvantage through low wages. The establishment of a minimum wage tends to drive such concerns out of business and thus concentrates production under the control of employers able to pay better wages. In this respect the operation of the minimum wage is similar in its effects to that of the union scale of wages. Like the latter, the minimum wage may become a means of gradually but progressively raising the general level of wages. In the United States the employing classes are, as a rule, though by no means universally, opposed to the introduction of the minimum wage principle. Organized labor also furnishes opponents to the principle, animated by the fear that its application will tend to the disintegration of the organizations. In Victoria, where the plan has passed beyond the experimental stage, opposition on the part of either labor or capital is practically nonexistent.

MINING. The art of working deposits of valuable mineral. The recovery and use of certain of the native metals was practiced by prehistoric peoples. Gold and meteoric iron were appreciated and searched for from very remote times. Native copper from Lake Superior was extensively mined and used by the aborigines of America. With the advance of civilization, the knowledge of metals increased and ores, or metals in combination, were recognized and utilized and mining proper began. Reference to mining is made in the Bible, and other ancient records prove that the Phœnicians navigated the seas as far as Cornwall, England, in order to obtain tin ores for the manufacture of bronze. The Romans had extensive mines for iron ore in the island of Elba. They also worked the great copper deposits of Rio Tinto, Spain. The mines of Laurium, Greece, were famous in ancient times for their yield of silver. From the old mining districts of Cornwall and from the Erzgebirge and the Harz mountains in Germany miners have gone all over the world, and their skill and experience have done much towards developing mining practice as it exists to-day.

The present article will be confined to a discussion of the art of mining as applied to the working of underground ore bodies. For placer mining see the article GOLD; for coal mining see COAL; see also QUARRY; DRILL; WELL SINKING. The handling of the ores immediately preparatory to and during the processes involved in extracting the metals is of a nature different from that of mining proper and is frequently done at places far from the mines. These operations are considered in the articles on ORE DRESSING, METALLURGY, and in the sections devoted to the metallurgy of the various metals and in the adjunct articles there mentioned.

Prospecting. The search for and location of deposits of mineral is called *Prospecting*, and the men performing this work are known as *Prospectors*. The procedure in prospecting a tract of land suspected to contain mineral wealth is thoroughly to traverse it, and to note carefully the familiar indications of the presence of minerals. These indications are often numerous in kind for each mineral and they also vary for different minerals. Generally speaking, coal, gypsum, salt and similar nonmetallic minerals occur in unaltered deposits, i.e., in rocks which have not undergone metamorphism, while the metallic minerals are found in rocks that have undergone metamorphism. These are among the broad indications of the presence or absence of certain minerals.

The geologic age of the rocks is in respect to certain minerals an indication whether these minerals are likely to be found or not. For example, the major portion of the coal deposits of the world have been found in rocks of the Carboniferous age; they exist at times in rocks of subsequent ages but almost never in rocks of preceding ages. The presence of iron is indicated by rustlike staining of earth and rock. The presence or absence of vegetation may also indicate the existence of minerals, e.g., a bed of phosphate rock is commonly indicated by a line of luxuriant vegetation, and the outcrop of a metallic mineral deposit by a lack of vegetation. Beds or deposits of magnetic iron ore and of certain of the nickel ores are frequently located by their attractive influence on the magnetic needle. In prospecting for placers, search is made for existing or ancient watercourses in which deposits of placer material are likely to have been formed. In prospecting for petroleum, natural gas and bitumen, the surface indications looked for are springs of petroleum, oil, or

naphtha; porous rocks saturated with bitumen; springs, pools, or creeks showing bubbles of escaping gas or an iridescent coating of oil. The presence of a mineral deposit of probable economic value having been established, it then becomes necessary to secure title thereto.

Legal Considerations. The laws of the various countries governing this point naturally differ somewhat, and should be carefully studied and complied with. If the deposit is located on government land, a "claim" of variable size, according to the laws of the country or district, is staked out, and when this is opened up sufficiently to have necessitated the expenditure of a certain specified sum of money, a permanent title can be obtained. In the Western States of the United States, claims usually extend 1500 feet along the vein and 300, or less, feet on each side of it. The owner can then follow the vein in depth where it leads him between the vertical planes of his end lines, this irrespective of the vertical projection of his side lines. Because of the irregularity of veins, much litigation has ensued and the law of the United States is open to much criticism. Many authorities consider that it would be better practice to adopt square claims, conveying the mining right to all ore lying vertically beneath them. This is the practice in British Columbia and in Mexico, and is practically so in the eastern United States, where title to the land, unless special reservations are made, carries title to the mining rights. In some States, notably in New York, and in many foreign countries, the State claims peculiar and special proprietary rights to deposits of useful minerals. Much variety also prevails in America in the size of claims other than for deep mines. Gold-bearing placers, i.e., have special sizes depending on local regulations. See MINES AND MINING, IN LAW.

Exploration and Development. Having found a mineral deposit and having obtained a legal hold on its ownership, the next step is its exploration and development. Exploration implies the determination of the extent, the richness, and the physical conditions obtaining. Development implies the confirmation of the results of exploration, and the preparation for subsequent mining operations. As work along both these lines is ordinarily carried on simultaneously, they will be treated under the one heading. The methods which may be employed for the exploration and development of a mineral deposit are: surface excavation; underground workings; churn drilling; and core drilling. It is usually the case that a combination of two or more of these methods will be used.

Surface excavation is strictly a preliminary form of exploration, its object being to determine the surface extent and character of the deposit in order that other methods of exploration may be more intelligently directed. This type of work is extensively used at Cobalt, Canada.

Underground workings, either as shafts or tunnels, may or may not be used as a primary means of exploration. They are, of course, invariably employed in the development stage.

Churn drilling, or the projection of vertical holes of from 6 inches to 9 inches in diameter to considerable depth by means of a special mechanical arrangement (see WELL SINKING), is extensively used in exploring ore bodies of wide area and irregular form. The material recovered from drilling, consisting of mud and gravel, indicates in a very satisfactory way the character and mineral contents of the rock passed through. Practically all of the so-called "Porphyry" copper properties recently opened have been explored in this manner.

Core drilling, or the projection of small holes 1 inch to 4 inches in diameter at any angle, with the recovery of cores of the rock passed through, gives excellent exploratory data. Unfortunately, however, this method is limited to those districts where the rock to be passed through is generally homogeneous in texture. It has been widely used in the Lake Superior copper, in the Michigan iron, and in the Sudbury nickel districts.

Mining. Having determined the extent, value and physical conditions obtaining, and granting that they indicate the mineral deposit to be of commercial importance, mining proper or the working of the deposit may be undertaken. The problems now presented are: magnitude of operations justified; method of working best suited to the conditions; the mechanical requirements.

Magnitude of Operations Justified. The question of the tonnage advisable to mine annually requires a balancing of four conditions, the total tonnage actually shown by the exploration and development work, the possibilities of finding future additional tonnages, the probable working costs, and the capital investment required. The two last mentioned items will naturally vary with the magnitude of the operations, therefore two or three cases within the legitimate possibilities of the property should be worked out. The desideratum is, of course, that scale of operation which will show the greatest ultimate net profit on the whole investment. In some special cases market conditions affecting the sale of the mine product must also be considered.

Method of Working to be Adopted. The successful solution of this problem requires careful consideration of the three main cost-making operations which enter into mining: the actual breaking down of the ore or stoping; the support of the excavated volume; and the transport of the broken ore to the surface. The governing factors in this consideration are: (*a*) the shape of the deposit; (*b*) its location with respect to the surface; (*c*) the physical character of the ore; (*d*) the physical character of the surrounding rock; (*e*) the cost of mine supplies (timber, power, etc.).

Stoping Methods.—The actual breaking down of the ore may be done by: overhand stoping; underhand stoping; side-cut stopes; or caving. Briefly described, the first two methods indicate the position of the workmen with respect to the body of ore to be broken. The third method, "side cut," the breaking of ore over horizontal areas, this usually preparatory to the fourth method or "caving," which implies the breaking down of the ore by its own weight or by the weight of overlying rock. The function of the workmen mentioned above is to drill holes in the rock or ore mass either by hand or by mechanical means. The holes so drilled are later loaded with an explosive which when fired shatters and breaks down the ore or rock.

Support of Mine Workings.—Because of the possible value or nonownership of the surface overlying an ore body it may become necessary to provide for the permanent support of the mined-out areas. Also in order to insure the safety of the workingmen underground and to

facilitate mining operations it is invariably necessary to provide temporary support. The methods which may be employed to this end are grouped as follows: mineral pillars; stull timbering; square-set timbering; waste filling; ore filling.

Mineral pillars were probably the oldest form of mine support and are still used in many mines where the value of the ore left standing as pillars is less than the cost of other methods of support. Working by this method implies the removal of the ore from a number of rooms, leaving ribs of unbroken ore at intervals. The proportion of the ore so left to the ore mined depends upon the thickness of the mineral body, the physical character of the ore, and the strength of the roof-forming rock.

Stull timbering is used in connection with relatively narrow and highly inclined deposits of high-value ore. The procedure is to mine out the entire ore area, placing at intervals timbers at right angles to the walls. The amount and size of timber to be used depend on the inclination of the ore body and the strength of the wall rock. This method is universal, and examples are afforded in almost any precious-metal mine.

Square-set Timbering.—In ore bodies where the width mined is greater than can be conveniently spanned by a single stick of timber and where the values contained in the ore are high, square-set timbering may be used, the supporting timbers being built up either rough or squared and so mortised at the ends that they fit together like the edges of a cube, 6 feet on a side. Others fit in with them, each stick entering into four adjacent cubes, and in the end a framework of timber of great strength is built up. This method of mine support was formerly extensively used at Butte, Mont., and at Bisbee, Ariz. Latterly, because of the excessive cost of timber, this method is being discarded.

Waste Filling.—This method, because of high costs for timber, is now widely used both in narrow and wide veins where the value of the ore warrants its complete removal. The procedure is to fill the worked-out volume with either waste rock or with the crushed rock discarded from ore-dressing operations, the only timber used being for temporary support at the immediate working faces and for the maintenance of passageways at intervals through the fill for the removal of ore.

Ore filling, or *shrinkage stoping*, is used when it is desired to afford a temporary method of support both in those types of ore bodies described as suitable to stull and square-set timbering and in those ore bodies of irregular form which it is intended ultimately to work by caving methods. The system is to break down the ore by overhand stoping and to allow the major portion of it to remain in the stope until mining is completed, only sufficient being drawn off to leave space at the face for the workingmen.

Caving.—As the name implies, in this system of mining provision is made only for the temporary support of the overlying rock or ore. When preliminary mining operations have proceeded sufficiently far the temporary supports are withdrawn or broken down, the overlying unsupported mass caving by its own weight or by the weight of the overlying rock. In this manner a large proportion of the ore may be broken without the use of labor or powder. Also a very material saving is made in not having to support the excavated volume. The conditions which make a caving system possible are an ore body of large area and a surface of no value. The mining and support of the first portions of an ore body which is to be worked by caving will make use of some one method or a combination of methods already described under the heading of mineral pillars, square-set timbering, or shrinkage stoping. Caving is widely used at present in the mining of the so-called "porphyry" copper deposits, in the iron mines of Michigan and Minnesota, and in the Kimberley, South Africa, diamond mines.

Mechanical Requirements. The application and selection of mechanical means to assist in mining operations require careful consideration involving the means which may be employed, the capital investment required, the life of the mine, and the saving in cost per ton to be effected. Many a mine has been equipped with an expensive mechanical outfit which while possibly well thought out from the mechanical engineer's viewpoint has not been justified by the life of the mine. On the other hand, it is frequently the case that a mine may be under-equipped, that the investment of capital in proper machinery would effect a saving in the per-ton cost which would mean the difference between a loss and a profit. In no industry does the saying that "the means must fit the end" hold more true than in mining.

The economics of the case having indicated that the use of machinery is justified, the first question is the choice of the primary motive power. This choice lies between the use of steam, as generated by the burning of wood, coal, or oil; gas, as generated and used direct from wood, coal, or crude oil; electricity, as purchased from power companies or as generated from local hydraulic power.

Having decided upon the cheapest, all things considered, prime mover, the next problem is the consideration of the uses to which the machinery may be applied. These may be divided according to location into (*a*) underground mechanical equipment and (*b*) surface mechanical equipment.

Underground mechanical equipment may be further classified into machines facilitating such operations as drilling, transport of broken ore or rock, and pumping.

Mechanical Drilling Machines.—These machines have as their object the drilling of holes in the rock or ore in order that the dynamite or powder used in blasting may be so placed as to obtain the best results. They are in direct competition with hand drilling and, except in prospecting and exploration work, are fast superseding the older method. The requirements of such machines are that they should be mobile, that they should be able to stand the hard usage and unfavorable conditions incidental to underground work, and that they should be as mechanically efficient as is consistent with the previously named conditions. Much ingenuity has been displayed in their design, but the type which has withstood trial and has proved worthy of consideration is that actuated by compressed air. The compressed air, delivered to the machine usually under a pressure of from 70 pounds to 100 pounds per square inch, is ordinarily generated on the surface and conducted underground in pipes, or it may, in the case of isolated individual units used in

development work, be generated underground at a point near the machine, electricity being used as the motive power for the compressor. Air drills are all reciprocating in their action and are of two types—the piston machine, where the reciprocating piston and the drill are joined together, the drill moving backward and forward with the piston, and the hammer machines, in which the piston is of a slightly different design and is not attached to the drill, the piston taking the form of an air-actuated hammer. Drilling machines directly operated by electricity have not proven a success in ore mining, although in mining coal and in quarry work electrically operated "cutters" are widely used. The equipment for generating compressed air will be described hereafter under *Air Compression.* See DRILL.

Transport of Broken Ore.—This problem may be twofold—the haulage of the broken ore from the stopes to the shafts and the hoisting from the shaft station to the surface. The consideration of the haulage facilities to be used is a question of the tonnage to be handled in a given period of time and the length of the haul. Originally the transport of ore underground was done on men's backs, and this method is still in use in Mexico, South America, and China. The next development was the use of wheelbarrows, a method still employed by prospectors. The wheelbarrow in turn was followed by the four-wheeled car running on tracks, actuated by man power, animals, or mechanical means. The use of the mine car operated by man power is practically universal in small-tonnage mines of to-day. In the larger mines where considerable tonnages must be handled and where the distances to be hauled are great it becomes necessary to use a more economical motive power. To that end rope haulage, compressed-air locomotives, storage-battery locomotives, electric trolley motors, and gasoline motors have been developed. The question of a choice between these various types of machines is purely a question of economics and flexibility of service desired.

Pumping Equipment.—In practically all mines some mechanical provision must be made for removing accumulating water, and in many mines the question of handling the water is all-important. The problem of water removal is met in two ways: if the flow is light or if the operations are of a very temporary nature, the water may be removed by bailing or the use of the hoist with a special bucket; if the flow is large or if the work is of a permanent nature, pumps will be installed at suitable locations underground.

Pumps may be classed according to the character of motive power into steam driven, compressed-air driven, and electrically driven. The first two types are practically identical in design for the smaller units; those of larger capacity may be so modified as to give greater mechanical efficiency. As used underground practice indicates that steam and air driven pumps be reciprocating in action and direct connected. Electrically driven pumps, now coming into wide use, are rotary in action and connected either directly or by gears to the motor. The prime requisite of mine-pumping machinery is reliability of action, mechanical efficiency being of secondary importance.

In this connection it may be well to make mention of the Cornish pump, the first pumping engine to handle large quantities of water successfully. Pumps of this type have been largely superseded by the types described above. There are still, however, places where it is in use and even where it is being installed. The Cornish pump consisted of a steam cylinder located near the shaft mouth, the piston being connected to and actuating a walking beam, the outboard bearing of which was directly above the pumping compartment of the shaft. Through this outboard bearing a line of timber rods passing down the shaft operated an encased plunger at the bottom. The operation of the plunger was similar to that of our deep-well pumps of to-day. On its down stroke the water barrel was filled, on its up stroke the water was lifted and forced into the water line leading to the surface, a corresponding quantity being displaced and discharged. See PUMPING MACHINERY.

Surface mechanical equipment must provide for some or all of the following operations: compression of air; hoisting; ventilation; generation of electric power.

Air compression is performed in either one or two stages in units of any size, in specially constructed machines which may be driven by any of the prime movers given. In this operation air at atmospheric pressure is taken into the compressor and compressed to pressures of from 70 pounds to 120 pounds per square inch with a proportional decrease in volume. The air so compressed is piped to the point of use—either the hoist, the pump, or the drilling machines. While it may be successfully argued that the use of a prime mover to generate compressed air which in turn is used to actuate other machinery is accompanied with a loss in efficiency, yet the conditions under which mine machinery must work more than offset this apparent lack in economy. The transmission of compressed air over long distances does not result in transmission losses as high as would be the case were steam piped under similar conditions. Furthermore, in underground workings it would be impossible to allow steam to exhaust into the air, while on the contrary an air exhaust is a benefit. See AIR COMPRESSOR.

Hoisting.—In those mines worked through shafts provision must be made for elevating the ore and men to the surface and for lowering men and supplies. This function is performed by machines variously known as hoisting engines, hoists, or winding engines. These engines, usually located near the shaft collar, consist of a drum or reel which may be rotated by means of a steam engine, a compressed-air engine, an electric motor, or a gasoline engine; the engine and drum are erected on the same bedplate, the driving power of the engine or motor being applied either by direct connection, gears, or friction drives. The rotation of the drum or reel winds or unwinds a wire cable which, passing over a sheave wheel supported on a suitable framework, variously known as a head gear, head frame, or gallows frame, directly above the shaft collar, is connected to the carrying receptacle (skip, cage, or bucket) and raises or lowers it at will. The whole operation is analogous to the use of elevators in our present high buildings.

Ventilation.—The problem of providing quantities of fresh air to underground workings has been a very essential part of the development of the coal-mining business. In the smaller metal mines, however, dependence is had on natural

ventilation, except possibly in isolated workings, and upon the exhaust from air drills and pumps. In the larger ore mines, and especially in those in which sulphide ores are found, the present practice is to follow the lead of the coal miner and mechanically to force ventilation, it having been demonstrated that the efficiency of the workman is increased if he has an adequate supply of good air. The blowers used are usually located close to the shaft collar or mine entrance, and are operated, either by direct connection or through gears or belts, by any convenient form of motor. These blowers are employed either to blow air into the workings or to exhaust air from them. They consist of a rotary fan incased in sheet metal and connected with the mine workings by large-diameter sheet-metal pipes. In the case of positive blowers the air taken in by suction at the centre of the fan is discharged at the periphery at a slight pressure into the pipe, which conducts it underground, usually to the lower workings, where it is discharged, the vitiated air being forced upward and out through the shafts or raises. Suction fans operate in the reverse manner, the vitiated air being taken into and carried to the surface through the pipes, while its place is taken by fresh air entering at the shaft collar.

Electric Power.—As has been indicated, electricity as a motive power for mining machinery has a wide range of usefulness. Perhaps the one factor which more than any other has caused its wide use is the ease, efficiency, and cheapness with which it may be conveyed from the point of generation to the place of use. The production of the electric power in the first place is a function of the surface mechanical equipment. The type of generating machine or dynamo will depend on the character of the current desired, which in turn is determined by the use to which it is to be put.

Closely associated with the surface mechanical equipment above described are the shops which must be provided for the repair and maintenance of the mechanical plant. The magnitude and equipment of these shops will depend upon the size of the mine and upon its distance from supply centres. In any event there must be provided a blacksmith shop, whose function it is to sharpen and maintain drills used underground, be they hand or machine. The normal small mine ordinarily has a combination blacksmith and machine shop, whose equipment will include a drill press and small lathe, in addition to a drill-sharpening and blacksmithing outfit.

Organization. The active life history of any mineral deposit can be divided into two periods —that of exploration and development and that of working or operating. During the first period there should be employed a consulting engineer to advise regarding the potential resources of the deposit and to outline the scheme of exploration and development to be followed. The man chosen for this work should have a thorough knowledge of mining geology, of practical mine management, and should have common sense. Needless to say he must be honest. The requirements are such that it is safe to say that no man with less than 10 years' active mining experience is likely to qualify. Under the direction of the consulting engineer will be the field manager or superintendent, whose chief qualifications should be getting work done under any and all conditions cheaply and quickly. On small operations he will probably act as his own bookkeeper, chemist, and surveyor. Under the superintendent will be foremen and shift bosses, who are directly in charge of the various squads of workmen.

During the operating or working period the organization will be divided into departments as follows: mining, mechanical, chemical, engineering, clerical, and metallurgical. The heads of each department report to the superintendent. It may be that on small properties the chemical and engineering departments will be merged and will be represented on the pay roll by one man or two men only. On such a property it is probable that the mechanical department would consist of not more than three or four men. On the other hand, large properties naturally mean enlarged departments with superintendents and foremen in each. Whether the work be large or small, it is imperative that there shall be an absolute placing of authority and responsibility.

Economics. Good business principles should apply to mining, although this does not seem to be realized by most business men investing in and operating mines. To use an analogy, a mineral deposit should be likened to a manufacturing enterprise in which the quantity of raw material is limited. If looked upon in this light there immediately present themselves three main items for consideration: (1) the sale value of the possible product; (2) the cost of production; and (3) the capital investment needed. The first item, the sale value of the product, requires an inquiry into what is a fair average selling price and what is the breadth of the market. The second, the cost of production, requires a special knowledge of mine and metallurgical operations and is best answered by specialists in the business and by inquiry as to what other people have done under like conditions. The third, or capital investment required, should likewise be answered by a specialist. With these three considerations investigated and answered it is a simple problem to figure the net returns to be expected, both annually and in total, and, applying this to the capital investment called for, to figure a percentage return on money invested. It should be remembered, however, that the profits resultant from mining investments must provide not only for interest on money expended but also for amortization of the investment itself within the life of the mine. Unfortunately the average mining investor misses this last point and forgets entirely that his dividend has such a twofold nature. It is because of this fact that the dividends paid or anticipated from an investment in a mining enterprise, in order to be at all attractive, must be greater than those paid by other industrials.

The question of what constitutes a proper and attractive return on such investments necessitates a consideration of the chances to be taken, which chances are dependent upon the degree of development and upon the geological and mineralogical character of the mineral deposit. Based on their degree development, mining properties may be broadly classed under two headings—prospects, or properties showing little or no ore developed, and mines, or properties having developed ore. In the first class, or prospects, it will be seen that any investment therein must be considered as purely speculative, for not only are the possible profits from the working of the ore, should it be found, a matter of estimate, but also the finding of ore in com-

mercial quantities is problematical. The only safeguards for such a speculative investment are the recommendation of an honest and able mining engineer, the assurance that sufficient cash has been raised to carry out development work as outlined, and that the management be honest and efficient. To assume such chances the investor is warranted in insisting that possible profits should be several times his investment.

In the second class, or mines, the question of a proper return on money invested is dependent on the size of the deposit and the character of the ore. In the case of some of the larger mining companies operating extensive deposits of iron, copper, lead, or gold ores where the life of the deposits can be safely calculated to run for many years, the elements of chance incidental to mining are so far eliminated that the investor would be justified in investing on the basis of 10 per cent annual profit in addition to the return of his capital within the life of the mine. In those companies operating mines where the ore bodies are small, as is the case in most of the precious-metal mines, and "where the profit in sight (the only guarantee in mine investment) is below the price of investment, the percentage of annual return should increase in proportion."

In any event the prospective investor should have submitted to him a written or printed statement covering the following points: name of company or property; location of holdings; area and character of holdings; status of ownership; classification of property, whether a prospect or a mine; character of product. In addition to the above general data there should be submitted, if the property is a prospect, the recommendations of a reliable engineer both as to the possible future of the property and the probable expenditures necessary for exploration and development work. If the property is a mine the statement of the engineer should indicate the amount and character of development work done; the amount and value of the ore developed; the operating costs, either as at present or as estimated; the justified working scale; the life of the developed ore; the probable total and annual profits; and the possibility of finding additional ore. In the case of the owner being a corporation a formal financial statement should be made.

With this information in hand the possible investor is in a position to form some opinion himself regarding the merits of the proposition and intelligently to seek advice of his own engineer, who will advise as to whether or not the purchase should be made, an option taken, or the proposition turned down, as the case may require.

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For current information reference should be made to: *The Mineral Industry* (New York, annually); *The Mineral Resources of the United States* (Washington, annually); the *Transactions of the American Institute of Mining Engineers* (New York, bimonthly); the *Transactions of the Mining and Metallurgical Society of America* (New York); the *Transactions of the Institution of Mining and Metallurgy* (London); and to special reports issued by the United States Geological Survey and Bureau of Mines and the Geological Survey and Mines Departments of other governments. Also much valuable information may be obtained from: the *Engineering and Mining Journal* (New York, weekly); the *Mining and Scientific Press* (San Francisco, weekly); the *Mining Journal* (London, weekly); the *Mining Magazine* (ib., monthly); the *Mining World* (Chicago, weekly); the *Canadian Mining Journal* (Toronto, weekly); the *Australian Mining Standard* (Melbourne, weekly). For special methods of mining, see the articles COPPER; GOLD; SILVER.

MINING, PLACER. See GOLD.

MINING CLAIM. See MINES AND MINING, IN LAW.

MINING ENGINEERS, AMERICAN INSTITUTE OF. A society founded in 1871 for the promotion of the arts and sciences connected with the economical production of minerals and metals, the discussion of professional papers, and the circulation of information connected with mining interests. It had a membership at the beginning of 1915 of over 5000, made up of honorary, elected, and associate members. The annual meeting of the institute is held in February, with other meetings during the year as authorized by the council. The institute publishes three volumes of *Transactions* annually and a monthly *Bulletin* which appears on the first of each month. The headquarters of the institute are in the Engineering Building in New York City.

MINING LOCOMOTIVES. See ELECTRIC RAILWAYS; LOCOMOTIVE; COMPRESSED-AIR LOCOMOTIVE; STEAM ENGINE.

MIN'ISTER (Lat., servant). A public functionary who has the chief direction of any department in a state government. (See MINISTRY.) Also the delegate or representative of a sovereign at a foreign court to treat of affairs of state. Every independent state has a right to send public ministers to any other sovereign state with which it desires to preserve relations of amity. Semisovereign states have generally been considered not to possess the *jus legationis* unless when delegated to them by the state on which they are dependent. The right of confederated states to send public ministers to each other, or to foreign states, depends on the nature and constitution of the union by which they are bound together. The constitution of the United Provinces of the Low Countries and of the old German Empire preserved this right to the individual states or princes, as do the present constitutions of the German Empire and Swiss Confederation. The Constitution of the United States either greatly modifies or entirely takes away the *jus legationis* of the individual States. Every sovereign state has a right to receive public ministers from other powers, unless where obligations to the contrary have been entered into by treaty. Diplomatic usage recognizes four orders of public ministers. These, as defined by the Congress of Vienna (1815), supplemented by that of Aix-la-Chapelle (1818), are the following: (1) ambassadors and papal legates or nuncios; (2) envoys and

ministers accredited to sovereigns; (3) ministers resident; (4) chargés d'affaires. Ministers of the first order possess the representative character in the highest degree, representing the state or sovereign sending them not only in the particular affairs with which they are charged, but in all other matters of state; they may claim the same honors as would be accorded their sovereigns if present in person. A principle of reciprocity is recognized in the class of diplomatic agents sent. States enjoying the honors of royalty send to each other ministers of the first class; so also in some cases do those states which do not enjoy them; but it is said that no state not possessed of such honors is entitled as matter of right to the acceptance by a royal or Imperial state of a minister of the first class.

Besides these orders of ministers there are other diplomatic agents occasionally recognized —as deputies sent to a congress or confederacy of states and commissioners sent to settle territorial limits or disputes concerning jurisdiction. These are generally considered to enjoy the privileges of ministers of the second and third orders. Ministers mediators are ministers sent by two powers between which a dispute has arisen to a foreign court or congress where a third power, or several powers, have, with the consent of the two powers at variance, offered to mediate between them.

Ministers sent to a congress or diet have usually no credentials, but merely a full power, of which an authenticated copy is delivered into the hands of a directing minister, or minister mediator.

The title "excellency" has since the peace of Westphalia been accorded to all diplomatic agents of the first class; and in some courts it is extended to ministers of the second class, or at least to those sent by the Great Powers.

By the American system ministers to exercise diplomatic functions at foreign courts are appointed by the President and confirmed by the Senate. See AMBASSADOR; ENVOY; CONSUL, MERCANTILE; DIPLOMACY; DIPLOMATIC AGENTS; INVIOLABILITY. See also CABINET. Consult the authorities referred to under the last three of these titles.

MINISTE'RIAL OFFICER. An officer whose functions consist in executing the command of a superior, or in performing a duty definitely prescribed by law. Its propriety is not left to his judgment or discretion. He is legally bound to perform it; and for a failure to do his duty he is liable in damages to the person in whose favor the duty was to be discharged. A policeman, sheriff, or marshal having a writ for the arrest of a designated person is liable for false imprisonment if he arrests any other person than the one named. Or, he may have arrested the wrong person because of mistaken information, yet having acted with due caution in making his inquiries. In both cases he is liable. As a rule the ministerial officer acts at his peril. Perhaps the harshest application of this rule is seen when he enforces legal process under an unconstitutional statute. If, on appeal, the statute is declared unconstitutional by the highest court of the state, the judges of the lower court are not civilly responsible for their blunder, but the sheriff who seized and sold property under the execution must respond to the owner for its value.

Oftentimes a judicial officer or a legislative body is required to act in a ministerial or executive capacity. Generally speaking, a judge acts ministerially when an application for a writ of *habeas corpus* is made to him. The law does not leave the granting or withholding of this writ to his discretion. A justice of the peace who has rendered judgment in a case before him is under a peremptory duty to issue an execution thereon at the request of the judgment creditor. In issuing or refusing it he acts ministerially, not judicially. If a statute charges a county judge with the duty of selecting jurors for the various courts sitting in the county, his acts under the statute are ministerial. Whether an act required by law of an officer is judicial or ministerial depends upon its character, and not on the rank of the actor. See OFFICER, and the articles there referred to.

MINISTER'S WOOING, THE. A story by Harriet Beecher Stowe, published as a serial in the *Atlantic Monthly* (1859).

MINISTRY. A body consisting usually of the heads of the chief executive or administrative departments of a government, and constituting an advisory council of the sovereign. In several European countries there is a chief minister who has a certain precedence in rank and authority over his colleagues and who is known as the premier or prime minister. In several others the chief minister bears the title of minister president and enjoys a certain precedence in dignity over his colleagues, but exercises no authority over them. Everywhere the right of selecting the members of the ministry belongs to the chief executive. In those countries, like England, where the crown is only the nominal executive, the head of the state selects only the prime minister and intrusts the selection of the others to him. In the German Empire, the Kingdom of Prussia, the Empire of Japan, and the American republics, where the ministers are not responsible to the legislature for their political policy, they are all appointed directly by the chief executive without being restricted to acknowledged party leaders. It is a general rule in European countries that members of Parliament may, with the approval of their constituents, serve as ministers. But, whether members of Parliament or not, ministers are entitled to sit in either House and to participate freely in the discussion of measures in which they are interested.

In general, the term "ministry" is synonymous with the term "cabinet" (q.v.), but there are exceptions. Thus, in Great Britain, the ministry includes, in addition to members of the cabinet, all those political undersecretaries who have seats in Parliament (at present about 40 in number) and who are expected to resign when their policy is defeated in the House of Commons; while the cabinet consists of a certain number of ministers (22 in 1915) who control the policy of the government and preside over the chief administrative departments. Thus it will be seen that not all the ministers are members of the cabinet. On the other hand, it may happen that some members of the cabinet will have no administrative duties. Such members are known as ministers without portfolios. Departments of administration over which ministers are generally placed are: foreign affairs, war, finance, justice, public education, public worship, navy, commerce, post and telegraphs, and colonies. In those countries where ministers are responsible to the chief executive they

act independently of one another in the conduct of their administrative departments, and their responsibility is individual rather than collective.

MINITARI, mē'nê-tä'rê, or HIDATSA, hêdät'sä. A tribe of Siouan stock (q.v.), closely related to the Crow (q.v.). Since known to the whites they have resided nearly in their present position on the Missouri River in North Dakota in close alliance with the Mandan and Arikara (q.v.). They call themselves Hidatsa, their popular name being of Sioux or Mandan origin and said to signify "people who have crossed over the water." Both they and a detached band of Arapaho were known to the French as Gros Ventres (q.v.). They occupied permanent stockaded villages of circular earth-covered log houses along the bluffs of the Missouri, where they had fields of corn, pumpkins, and sunflowers and made periodic excursions into the open plains to hunt the buffalo, at which times they lived in tepees. Like their allied tribes, they had elaborate ceremonials and social organization. They have been uniformly friendly to the whites. In 1804 they were estimated at 2500, but have decreased rapidly, first from the smallpox of 1837 and later from the diminished food supply consequent upon the destruction of the buffalo. They number now about 547 and live with the Mandan and Arikara upon the reservation at Fort Berthold. Consult Washington Matthews, *Ethnology and Philology of the Hidatsa Indians* (Washington, 1877), and R. H. Lowie, "Societies of the Crow, Hidatsa, and Mandan Indians," in *American Museum of Natural History, Anthropological Papers*, vol. xi (New York, 1913).

MIN'IUM, or RED LEAD. A beautifully scarlet crystalline substance consisting chiefly of lead orthoplumbate, $2PbO \cdot PbO_2$. It is made by cautiously heating massicot or white lead in a reverberatory furnace or in special barrel-shaped ovens open at both ends. If heated, minium gradually changes its color, becoming violet and ultimately black; but it regains its original color on cooling. If ignited in the air, minium is converted into the monoxide of lead. Minium is used as a mineral color, yielding a fine paint. It is also employed in the manufacture of flint glass. See LEAD.

MIN'IUS. The Roman name for the river MIÑO.

MIN'IVET. One of a group of about 20 species of small shrikelike birds of the Oriental region. The males are, in general, black and rose, while the females are gray and saffron. Consult Blythe, *Mammals and Birds of Burma* (London, 1875), and other authorities on Oriental ornithology cited under BIRD.

MINK (probably from Swed. *mänk*, mink). Any of several species of weasel-like animals of the genus *Putorius*, family Mustelidæ, distinguished from the martens, stoats, etc., by their semiaquatic habits and certain peculiarities of dentition. Very recently *Putorius* has been considered as a subgenus of *Mustela*. The American mink (*Putorius vison*) is found throughout North America, but especially in the northern and mountainous parts. The European mink (*Putorius lutreola*), usually called norz or mänk, occurs in Finland, Poland, Scandinavia, and Russia and formerly extended as far west as central Germany. The mink of Siberia (*Putorius sibirica*) is a quite distinct but little-known species. The American mink is somewhat larger than the European species (15 to 18 inches long, besides the tail, 9 inches) and is further distinguished by the black upper lip; in the European mink the upper lip is white.

Minks are inhabitants of well-watered areas, haunting the banks of streams and borders of ponds in search of their food and making their homes in burrows which open near the water. They are excellent swimmers, having the feet partially webbed, and spend much time in the water. Although, like other Mustelidæ, they eat birds, small mammals, and eggs, the principal food of minks comes from the water; thus, fish, frogs, salamanders, crayfish, and even mollusks form their chief diet, and muskrats and other water-loving mammals also fall prey to their voracity. The fur of the mink is of great value commercially, though the price varies much with color and quality. (See FUR AND THE FUR TRADE.) Minks are usually brown, sometimes rather light, but more often very dark, especially along the middorsal line. The darker the animal the more valuable it is. The fur is made up of a dense undercoat and an outer coat of long, shining hairs, and the skins from the coldest regions are usually the most valuable. Like all its near relatives, the mink is bloodthirsty and cruel. It is very courageous, and when cornered is savage. The young are born in the early spring, usually in a hole in the bank of some body of water, where plenty of food is easily obtained. The number of young is about six in a litter. The mink is second only to the skunk in the strength, penetrating power, and nauseousness of the odor of the secretion in the anal glands, but fortunately it is only when the animal is greatly enraged that the odor becomes very disagreeable. Minks are said to be easily tamed if taken young, and to enjoy being petted, but their temper is capricious, and as they grow old they become dangerous. Civilization seems to have little effect upon them, there being few districts so completely cleared or densely settled as not to afford them some sort of refuge.

Consult: Audubon and Bachman, *Quadrupeds of North America* (New York, 1851); Elliott Coues, *Fur-Bearing Animals* (Washington, 1879); Stone and Cram, *American Animals* (New York, 1902); E. T. Seton, *Life-Histories of Northern Animals* (ib., 1909); Ned Hollister, "A Synopsis of the American Minks," in *United States National Museum, Proceedings*, vol. xliv (Washington, 1913). See FUR-BEARING ANIMALS.

MINK FROG, HOOSIER FROG, or NORTHERN FROG. A small frog (*Rana septentrionalis*) of the northwestern United States. It is 2¼ inches long from nose to vent, dark olive green above, with sooty-brown bars and blotches, and pure white underneath. Its hazel iris, minky color, and quiet solitary habits distinguish it from others. A detailed account of its features and ecology was given by J. H. Garnier in the *American Naturalist*, vol. xvii (Philadelphia, 1883).

MIN'KOPIS. The inhabitants of the Andaman Islands. See MINCOPIES.

MINKOWSKI, mīn-kôf'skĭ, HERMANN (1864–1909). A mathematician, born at Alexoten, Russia, but a resident of Germany. He was educated at the universities of Berlin and Königsberg (Ph.D., 1885) and served as a lecturer (1887–93) and assistant professor of mathematics (1893–94) at Bonn and as professor of mathematics at Königsberg (1894–96), at the Zurich Polytechnic (1896–1902), and at Göttingen (1902–09). His publications include: *Geometrie der Zahlen* (1896); *Diophantische Approxima-*

tionen, eine Einführung in die Zahlentheorie (1907); *Gesammelte Abhandlungen* (1911).

MINNA VON BARNHELM, mĭn'nâ fŏn bärn'hĕlm. A comedy by Lessing, produced at Hamburg in 1767.

MIN'NEAP'OLIS. A city and the county seat of Ottawa Co., Kans., 128 miles by rail west of Topeka, on the Solomon River and on the Union Pacific and the Atchison, Topeka, and Santa Fe railroads (Map: Kansas, E 4). It derives considerable trade from the adjacent farming and stock-raising country and has grain elevators, flour mills, carriage shops, a foundry, etc. Building stone is quarried in the vicinity. There are a public-school library and municipally owned water works. Pop., 1900, 1727; 1910, 1895.

MINNEAPOLIS. The largest city of the State of Minnesota and the county seat of Hennepin County, situated at the Falls of St. Anthony, on the Mississippi River, above St. Paul, the suburbs of which join those of Minneapolis, the two municipalities being termed Twin Cities (Map: Minnesota, D 6). The river, which divides the city into unequal portions, the main portion being on the right bank, is crossed by a number of massive highway and railroad bridges. The Falls of St. Anthony are in the heart of the manufacturing district.

Minneapolis stands on a gently undulating plateau, 800 feet above sea level, in a picturesque lake region much frequented as a place of resort. There are several lakes within the city limits, and of others in the immediate vicinity, Lake Minnetonka is the largest and most popular. The city is about 10 miles long by 6 in width and has an area of 53 square miles. Its streets are broad and regular. An extensive park system (3783 acres) has been developed, embracing several lakes, 50 parks, and 50 miles of parkway, almost all of which are skirted by a wide boulevard known as the Grand Rounds. Of particular note are Kenwood Boulevard (150 feet wide), Loring and Gateway parks, in the centre of the city, and Minnehaha Park, containing the Falls of Minnehaha, 50 feet in height. Adjoining the park are the beautiful grounds of the State Soldiers Home. Minneapolis has many handsome public and business edifices, besides a number of attractive churches. Among these are the cathedrals of the Immaculate Conception and St. Mark; Central High School; Minneapolis Institute of Arts; the county courthouse and city hall building, erected in 1900 at a cost of $3,500,000 and offering from its main tower, 345 feet high, a superb view of the city; the public library and post office, both fine Romanesque structures; Raddison, Dyckman, and Andrews hotels; and the Plymouth, Andrus, Palace, McKnight, Security Bank, and Soo First National Bank buildings.

Commerce and Industry. The conditions which have contributed most to the industrial development of Minneapolis are the advantages afforded by the Falls of St. Anthony and their convenient location in relation to the abundant grain and timber of the Northwest. Excellent transportation facilities give the city command over these supplies and over the markets of the country, its jobbing trade in 1914 having amounted to about $300,000,000. Twenty-two lines of railway, operated under 10 systems, enter the city, and a complete system of interurban electric lines has been effected. With these advantages Minneapolis has developed into the foremost city of the Northwest, being noted particularly for its manufacturing and wholesale interests. The first manufactory in the State was established at the Falls of St. Anthony. It was used first as a saw mill and then as a flour mill. The power afforded by the Falls has been utilized more and more, until Minneapolis has become the largest flour and lumber market in the world. The water power at the Falls of St. Anthony was developed, previous to 1879, to yield 30,000 horse power, and in 1897 a new dam, giving 10,000 horse power, was completed. The United States government is (1915) constructing a system of locks and dams below the Falls which will add 40,000 horse power and which will place Minneapolis at the head of navigation. For a number of years the lumber industry was most important, but after the introduction of improved processes of flour milling in the seventies, the latter industry surpassed lumber manufacturing and has since rapidly outstripped it. The flour mills in the Falls district are now the largest in the world. The value of their output in 1905 was $62,700,000, while in 1914 this was increased to $90,000,000. Lumber products worth $12,000,000 were made in the same year, and an equal value each of machinery, linseed oil and meal, and food and clothing. Other manufactures brought the total value of the city's industrial output in 1914 to $165,000,000, on an invested capital of $90,000,000. Minneapolis was the first city in the United States definitely to plan a combined factory and residence district wherein industries are guaranteed the trackage and transfer facilities that they need and where workmen may make their homes among natural woods and gardens. In 1914 there were received in the city 200,000,000 bushels of grain, of which 90,000,000 were wheat. Fifty elevators, with a capacity of 40,000,000 bushels, stored and cleaned this grain.

Finance. According to the Minnesota law, assessment is made on a 40 per cent valuation. The assessed valuation of the city in 1914 was $196,303,280. This, at a rate of 35.77 mills, yielded a revenue of $6,644,866.08. Of this amount there was spent: for schools, $2,037,831; for police and fire protection, $1,019,000; for interest on debt, $850,000. The city owns and operates its water works, which, with a recently installed filtration plant, are valued at $1,500,000. Another municipal enterprise is a garbage consumer, from which enough current is obtained to light a considerable portion of the city. The bonded indebtedness is $22,237,200, offset by a sinking fund of $4,087,203 for the retirement of bonds. The city is the home of the Federal reserve bank for the ninth district. Its 25 banks have a capital of $8,000,000 and a total deposit of $120,000,000.

Education. Minneapolis sends 50,000 children to the public schools, and of these 6000 are in the five high schools. The city is coöperating with the Dunwoody Institute, a vocational school for boys, and is itself conducting a similar school for girls. The University of Minnesota (q.v.) is situated here, while other institutions include Stanley Hall, Graham Hall, and St. Margaret's Academy, for girls; Blake School and De La Salle Institute, for boys; Augsburg Seminary (Lutheran), Minnesota College; the Johnson School of Music and the Northwestern Conservatory of Music; the Handicraft Guild and the Minneapolis School of Fine Arts. More than 10,000 pupils attend these schools and the

nine commercial colleges. There is a public library, with 290,000 volumes for circulation from its main building and from 35 branches and stations.

Within the last 10 years the city has made wonderful progress in the arts. The Minneapolis Symphony Orchestra (q.v.) is recognized as one of the best organizations of its kind in America, and the Minneapolis Institute of Arts, dedicated in 1915, together with the private gallery of T. B. Walker, makes the city conspicuous as a music and art centre. The interest in music is manifest in the many choral and orchestral clubs, and the interest in art in the fine sculptural works to be seen in different parts of the city. Notable among these are French's statue of Governor Pillsbury, on the university grounds, and Jacob Fjelde's figure of Ole Bull, in Loring Park, and of Hiawatha, in Minnehaha Park.

Government. Minneapolis is governed under what is known as the Federal plan. A council, consisting of two aldermen from each of the 13 wards, legislates. Its powers, however, are limited by the State to such an extent that the city has endeavored to secure a new charter that will give home rule and result in greater efficiency. The mayor, treasurer, and comptroller are the executive officers. The mayor is in charge of the police. He has the power of veto on all council measures, subject to the usual two-thirds overruling vote. In addition to these officers there are the school, park, and library boards, the members of which are elected; a board of corrections and charities, consisting of the mayor and four of his appointees; and the board of tax levy, composed of the mayor, the presidents of the council, school, park, and library boards, and one county commissioner. This board meets each year to determine the rate. Two elected judges preside over the municipal court. Elections are held biennially. A civil-service commission examines applicants for positions in city offices and on city works. Other special features of the government are the patrol-limits system, by which saloons are confined to a small area in the centre of the city, and a public-morals board, which advises the mayor and the council as to the moral condition of the city.

History. The first white man known to have visited the site of Minneapolis was Father Hennepin. In August of 1680, while on his way to rejoin La Salle, he passed the falls and named them St. Anthony. Various French fur traders followed Hennepin, and Jonathan Carver (q.v.) in 1766 made a journey up the Mississippi and Minnesota rivers. Upon his return he published a glowing account of the country, emphasizing its "exceeding beauty" and its great commercial possibilities. In 1805–06 Lieut. Zebulon Pike was sent into the country of the Sioux to induce them to make peace with the Chippewas and to assert the right of the United States against that of the English traders established on the upper Mississippi. In the treaty that Pike concluded with the Sioux was a clause ceding to the United States a strip of territory extending from the confluence of the Mississippi and Minnesota rivers northward for 9 miles on each bank of the Mississippi. This included the Falls of St. Anthony and the site of Minneapolis. In 1819 the United States government, following the suggestion of Major Long and in compliance with the request of the Astor fur interests, sent Colonel Leavenworth to build a fort at the mouth of the Minnesota. Leavenworth's successor, Col. Josiah Snelling, placed the fort, named for him, on the near-by bluff. In 1823 the government built a mill (where a great mill now stands) for the manufacture of lumber and flour for the fort. Before the land on the east bank of the river had been opened to settlement several of the fort's officers had squatted on claims from which they proposed to control the water-power rights. Franklin Steele held the choice site in 1848, when settlement was legalized. He platted a village, St. Anthony, in that year and built the first commercial saw mill. Maine lumbermen soon hurried to the new village, and it grew rapidly. Shortly afterward a university was established. Like the soldiers, however, the newcomers squatted on government land embraced in the Fort Snelling reservation on the west bank of the Mississippi. Col. John Stevens, holding for Steele a claim facing his town site, built the first house in Minneapolis proper in 1850, on the site of the Union Station. Before the claims were legalized in 1855 a village of considerable importance had developed, but after that date it grew more rapidly than St. Anthony. The settlement, having previously borne several names in succession, was incorporated in 1856 as the town and in 1867 as the city of Minneapolis. In 1872 the city of St. Anthony, directly across the river, which had been settled in 1837 and incorporated in 1855, was annexed. After 1860 the growth of the city was exceedingly rapid. From 1886 to 1893 a large Industrial Exposition was held here, and in 1892 the Republican National Convention met in the Exposition Building. Pop., 1870, 13,066; 1880, 46,887; 1890, 164,738; 1900, 202,718; 1910, 301,408, including 85,938 persons of foreign birth; 1914 (U. S. est.), 343,466; 1920, 380,582. Consult: Isaac Atwater, *History of the City of Minneapolis* (New York, 1893); W. W. Folwell, *Minnesota, the North Star State* (Boston, 1908); H. B. Hudson, *A Half Century of Minneapolis* (Minneapolis, 1910); E. Dudley Parsons, *The Story of Minneapolis* (Minneapolis, 1913).

MINNEAPOLIS SYMPHONY ORCHESTRA. In 1903 a number of music lovers of Minneapolis formed the Orchestral Association of Minneapolis. Having raised a guarantee fund of $10,000, they established the Minneapolis Symphony Orchestra of 60 performers, with Emil Oberhoffer as conductor. Immediately the organization took its place among the foremost symphony orchestras of the United States, and a new fund was subscribed for five years. In 1915 the guarantee fund amounted to $65,000. The number of players was gradually increased from 60 to 90, Mr. Oberhoffer being retained all the time as conductor. At present the orchestra plays about 40 concerts a season in its home town and an average of 130 concerts on tours extending all over the United States. It owns an extensive library.

MIN'NEDO'SA. The chief town of Marquette electoral division, Manitoba, Canada, on Little Saskatchewan River and on the Canadian Pacific Railway, 125 miles west-northwest (direct) of Winnipeg (Map: Manitoba, C 3). Its industrial establishments include five grain elevators, three lumber yards, and a sash and door factory. The town has an electric-light and telephone system. Pop., 1901, 1052; 1911, 1483; 1915 (local est.), 2000.

MINNEHAHA, mĭn'nê-hä'hâ. The heroine of Longfellow's Indian poem, *Hiawatha*, who is

represented as the daughter of an old arrow maker. The name Minnehaha (Sioux *Mini-haha*, curling water) is borne by a picturesque cascade, about 50 feet high, in the Minnehaha River, a small stream emptying into the Mississippi at Minneapolis, Minn. It may be mentioned that in Longfellow's work the hero has an Iroquois name, the heroine a Sioux name, while the poem itself is based upon the Ojibwa legends published in Schoolcraft's *Algic Researches*.

MIN'NESING'ER. The common name for mediæval German lyric poets, preceding the meistersinger (q.v.), and especially for German court lyrists of the twelfth and thirteenth centuries, because their principal theme was *minne*, or love. Among other subjects of minnesong were nature, religion, patriotism, politics, and homage to princely patrons. Heinrich von Veldeke (q.v.), one of the earliest minnesingers, was also an epic poet. Minne poetry has three epochs. In the first, a little after 1150, with Der von Kürenberc as its earliest-named poet, lyric poetry begins to free itself from the epic; the second is its brilliant period, with Walther von der Vogelweide (q.v.) as its most brilliant example; the third, beginning about 1300, with Oswald von Wolkenstein as its last representative, marks its decline and the rise of the meistergesang, cultivated by the meistersinger (q.v.). The metrical form of these lyrics was at first simple, though somewhat varied, with rhyme and, with decreasing frequency, assonance. Der von Kürenberc's four-line stanza with one extra beat in the last half line became so popular on the Danube that it was adopted by the writers of the Nibelungenlied (q.v.). Under French influence the form became more artificial. Each minnesinger felt a proprietorship in such metrical forms as he had originated. The ditties of early singers such as Dietmar von Aist, Der von Kürenberc, Meinloh von Seveningen, and the burgraves of Regensburg and Rietenburg are marked by simplicity of thought and by absence of repining. The minnesingers, like the troubadours (q.v.), throve in the heyday of chivalry. How deeply each of the minnesingers was influenced by the troubadours, and to what degree they drew upon the traditions and customs of their own land, or finally to what extent they imitated once genuine emotions or spoke from their hearts, is often extremely problematical. Certainly the oldest poems utter true experience and represent the lover as wooing with ardor but proud self-respect; but later, under Provençal influence, he appears as the cringing vassal of his lady love. Some of the most ancient German poems are put into woman's mouth, but we can scarcely conclude that women were therefore among the minnesingers, though several ladies, as, e.g., the Countess of Dia, wrote love poems in Provençal.

With the more artful verses of the Burgrave Rietenburg, Provençal influence becomes clear. To all people *minne* meant love, but to the lordlier poets or to those who sang in their halls *minne* had an exalted significance. The older and far more genuine sentiment between men and women becomes either Platonic affection or sensual desire. We shall find that the minnesingers were merely doing what had been done a little sooner by the troubadours, but the minnesong was not so brilliant, though it was almost as artificial as the poems written in the best period (1100–1260) of Provençal literature (q.v.). The Germans cultivated such forms as were popular in southern France, as the love poem proper, the *sirventes* (q.v.), and the *tenzon* (q.v.). Like the troubadour, the minnesinger sang the praises of his lady, who was often his patron's wife. Of her he made an earthly angel, and whatsoever boon she might grant him was his bliss. The minnesingers whose dialect puts them on the western boundary of Germany first show French influence. Provençal influence is earliest perceptible in Friedrich von Hausen, a Franconian from the Rhine. The dactylic rhythm bears witness also to a romantic origin. Minnesingers who used it were, besides Friedrich von Hausen, Heinrich von Veldeke, Heinrich von Morungen, Hartmann von Aue, Walther von der Vogelweide, Hildbold von Schwangau, and Ulrich von Liechtenstein.

With Friedrich von Hausen we first meet the Crusading song. Walther von der Vogelweide gave the fullest utterance to the minnesong. In him we find both courtly and popular elements. Walther also modeled poems after romantic patterns. Austria was the centre of court poetry. There Reinmar had lived and there Walther had learned his art. Neidhart had first composed for peasants songs and dances, but his ambitious tendencies displeased them and he turned to the court. With Walther and Neidhart the road goes in twain, and each had his followers. Princes had been among the troubadours. So it was in Germany, where Henry VI and Conradin were singing in the south, while farther north were Duke Henry II of Anhalt, Margrave Otho IV of Brandenburg, and Henry III of Meissen.

The most important manuscripts are the Weingarten, the small and the large Heidelberg collections. The last contains 7000 strophes from 140 poets.

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MIN'NESO'TA. One of the North Central States of the American Union. It lies around the headwaters of the Mississippi River, between lat. 43° 30′ and 49° 25′ N. and long. 89° 29′ and 97° 5′ W. It is bounded on the north by the Canadian provinces of Ontario and Manitoba, on the east by Lake Superior and the State of Wisconsin, on the south by Iowa, and on the west by the Dakotas. It has an extreme length north and south of about 400 miles, and east and west of 380 miles, but its average width is only 240 miles. It comprises an area of 84,682 square miles, of which 3324 square miles are water. It ranks tenth in size among the States.

Topography. Minnesota may be said to be divided into three areas which slightly overlap. First, the highland district, which is popularly known as the Height of Land, 1750 feet above sea level, which slopes off in all directions, thus forming the watershed for three great river systems—the Red, the St. Lawrence, and the Mississippi. These highlands include the famous Vermilion, Mesaba, and Cuyuna iron ranges, and are covered with dense forests of pine, hemlock, spruce, and other evergreens, which originally extended southward to within 25 miles of the twin cities, but were terminated on the west by the slope of the Red River valley. Second, the hardwood belt, which fringes the west edge of the evergreen district, but spreads out on the south border to a width of 50 miles, ending in what was called by the Sioux "the Big Woods," a forest of immense maples, elms, oaks, and other varieties that the farmer has not wholly conquered after 50 years of constant cutting. The remainder of the State, including the fertile Red River valley, the counties on the upper Minnesota River, and those of the two southern tiers, is the prairie, treeless save only for the wooded slopes of the streams and the groves planted by the settlers, many of which, however, are now yielding crops of merchantable timber. In the southwest portion of this district the surface is broken by the coteaux des prairies, but these never attain any great height. The lowest parts of the State are the region around the head of Lake Superior and the southeastern section, where the land falls to a height of 600 feet; the very highest part is the Mesabi district, 2200 feet above sea level. The surface of the State shows the glacial action characteristic of the neighboring States, but has retained more of the moraine lakes, which are scattered thickly over the whole surface, whether forest or prairie land, to the total number of over 10,000.

Drainage. The three large river systems referred to provide an adequate drainage for the State, except in a limited area in the region of Red Lake, now drained artificially. The Mississippi receives as its chief tributaries the St. Croix, which makes the Minnesota-Wisconsin boundary line, and the Minnesota, besides innumerable smaller streams, before it leaves the State. Thus it drains over one-half the area. Although the Red River rises in Lake Traverse, less than 2 miles from the source of the Minnesota, and flows northward to Lake Winnipeg in Canada, it receives its chief supply from the west slope of the divide. Along the north boundary the Rainy River, fed by short streams from the Height of Land, finds its way to Lake of the Woods; and into Lake Superior pours the flood of the St. Louis River from the south slope of the divide. Although the Minnesota and Red rivers are reputed "navigable," the Mississippi is the only one of these streams that is much used commercially, except for the power that many of them furnish.

In the south the lakes are often broad and shallow. Three-fourths of them occupy hollows left in the moraines, or deposits of the glacial age, which cover the greater portion of the State. Others, such as Lakes Pepin, Traverse, Big Stone, and Rainy, are river expansions. The lakes vary in size from mere ponds to Red Lake, the area of which is 340 square miles. The other more important bodies are Leech and Winnebigoshish in the plateau region, Mille Lac, and Minnetonka, a popular summer resort for the twin cities. Rainy Lake, on the north border, which has been made accessible to tourists since 1900, is fast becoming the most famous of resorts. In the glacial period an immense lake 700 miles wide was formed in the valley of the Red River. At first it was drained by way of the Minnesota River into the Gulf of Mexico, but as the ice disappeared the lake was drained northward into the Nelson River, leaving a wonderfully rich plain, marked on its east border by successive beach lines. Upon this plain Minnesota farmers have raised great crops of wheat for over 30 years. This ancient basin is known as Lake Agassiz.

Climate. Minnesota lies in the middle of the north temperate zone and in the geographical centre of the continent. This gives it a climate which, although subject to great extremes, maintains an average temperature that makes certain the annual production of a great diversity of grasses, vegetables, and fruits. The average temperatures for January are 15° F. at the southeast corner and 1° F. at the northwest corner. For July it is 70° F. in the south and 65° F. in the north. The temperature has risen to 100° in the shade on occasions in the past 25 years, and on occasions it has fallen to 40° below zero. These extreme temperatures never last more than a day or two at a time. The annual rainfall ranges from 20 inches in the northwest to over 30 inches in the southeast. The rainfall is characterized by a scant precipitation in the winter season and moderately heavy rains during the crop season. There is an annual snowfall of 20 inches in the southwest and nearly 80 in the extreme north. The southern counties have an average relative humidity of less than 70 per cent; the northern counties 75 per cent. The prevailing wind is west in the northern half and southwest in the southern half. Nights are always cool, tempering the heat of summer, and the air is always dry, counteracting the cold of winter. Because of this evenness of summer, as well as for the many advantages that the State offers to those seeking recreation, Minnesota has always been a favorite summer resort. Every year great numbers of campers and excursionists scatter over the State.

Soils. The soils are wholly glacial, and since the outcropping stratified rock is largely limestone, most of the soil derived from this source is very rich—a fine black loam. On the older drift in the southeastern counties, for 30 or 40 miles back from the Mississippi River, there is a coating of loess, a loam of exceptional fertility. Where the Cambrian sandstone outcrops in the east-central part of the State, considerable areas are covered with a light, sandy soil that until recently seemed not at all encouraging for agriculture; but, with improved methods of tilling and with a better understanding of the chemistry of soils, these areas are being brought under cultivation. It is in this part of Minnesota that a great part of the potato crop, that reached a total of 15,000,000 bushels in 1914, is produced. In the old land of the northeast and north-central districts there are areas almost denuded of soil, or covered with a scanty coating of granite drift. In 1914 the people voted to give the forestry board the power to reforest this land and so cause it to produce once more the pine that it has in the past abundantly borne, the only crop that it will

MINNESOTA
SCALE OF STATUTE MILES
0 10 20 30 40 50 60
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80 90 100
County Towns
Railroads
DOMINION OF CANADA
MANITOBA
ONTARIO
LAKE SUPERIOR
KITTSON
ROSEAU
MARSHALL
PENNINGTON
RED LAKE
POLK
NORMAN
CLAY
BECKER
BELTRAMI
KOOCHICHING
ITASCA
CASS
HUBBARD
WADENA
SAINT LOUIS
LAKE
COOK
HUNTERS
Thief River Falls
Grand Forks
Crookston
Red Lake Falls
Moorhead
Detroit
Bemidji
Duluth
Two Harbors
Virginia
Hibbing
Ely
Grand Marais
Hovland
Tofte
Lutsen
Schroeder
Beaver Bay
Knife River
Lake of the Woods
Rainy L.
Sturgeon L.
Red Lake
Upper Red Lake
Lower Red Lake
Leech L.
Cass L.
Winnibigoshish L.
Vermilion L.
Kabetogama L.
Namakan L.
Pelican L.
Mille Lacs L.
Pokegama L.
Sand L.
Greenwood L.
Burntside L.
Trout L.
Loon L.
Crane L.
Pipestone L.
Kwetiko L.
Long L.
Seine R.
Little Turtle R.
Turtle R.
Manitou L.
Crow L.
Whitemouth L.
Roseau R.
Red R.
Rainy R.
Big Fork R.
Little Fork R.
Sturgeon R.
Black R.
Rapid R.
Vermilion R.
St. Louis R.
Cloquet R.
Mississippi R.
Pine R.
Crow Wing R.
Leech Lake Ind. Res.
Cass Lake Ind. Res.
Winnibigoshish Ind. Res.
Bois Fort Res.
Red Lake Indian Reservation
Vermilion Lake Ind. Res.
Grand Portage Indian Res.
Tamarac R.
Buffalo R.
Otter Tail L.
Mud L.
Lake Itasca
Itasca State Park
Mesabi Range
Vermilion Range
Gunflint Trail
Apostle Islands
Bayfield
Madeline I.
Outer I.
Bear I.
Sand I.
Presque I.
Grand Portage I.
Isle Royale
Minneapolis
Fargo
Winnipeg
Superior
Ashland
Hancock
Marquette
Sault Ste. Marie
Chicago
Milwaukee
Green Bay
Toronto
Ottawa
Montreal
Quebec
Boston
New York
Washington
Philadelphia
Pittsburgh
Cleveland
Detroit
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Albany
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Charlottetown
Fredericton
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Toronto
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Hamilton
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Sarnia
Windsor
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Milwaukee
Green Bay
Madison
Dubuque
Davenport
Rock Island
Peoria
Springfield
Indianapolis
Cincinnati
Louisville
Nashville
Memphis
Vicksburg
New Orleans
Mobile
Pensacola
Tallahassee
Jacksonville
Savannah
Charleston
Wilmington
Norfolk
Richmond
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Norfolk
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Washington
Baltimore
Philadelphia
Trenton
New York
Boston
Portland
Augusta
Bangor

WISCONSIN
IOWA
SOUTH DAKOTA
NORTH DAKOTA
OTTER TAIL
Fergus Falls
Staples
Brainerd
Crow Wing
Mille Lacs
MILLE LACS
PINE
Cloquet
Duluth
Superior
Ashland
Bayfield
Apostle Islands
Lake Superior
Lake Michigan
Green Bay
Menominee
Marinette
Oconto
Sturgeon Bay
Door Peninsula
Manitowoc
Sheboygan
Milwaukee
Racine
Kenosha
Waukesha
Walworth
Rock
Janesville
Beloit
Dodgeville
Platteville
Lancaster
Boscobel
Prairie du Chien
Viroqua
Sparta
Tomah
Wisconsin Dells
Stevens Point
Wausau
Rhinelander
Eagle River
Ashland
Hurley
Iron River
Bayfield
Ontonagon
Houghton
Hancock
Calumet
Marquette
Ishpeming
Negaunee
Escanaba
Menominee
Iron Mountain
Crystal Falls
Ironwood
Bessemer
Watersmeet
Michigan
Lake Michigan
Lake Superior
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Lake Michigan
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Lake Huron
Lake Erie
Lake Ontario
Lake Winnebago
Lake Mendota
Lake Monona
Lake Geneva
Lake Koshkonong
Longitude 94° West from 93° Greenwich
96°
95°
92°
91°
A
B
C
D
E
F
G
5
6
7
15
45
44
46

bear. In the valley of the Red River the silts of old Lake Agassiz occur. On this is raised the immense wheat crop that annually brings to Minnesota great wealth from all parts of the world. Finally, in the Red Lake region there are swamps, once believed to be waste land.

By drainage, however, this land is being opened to cultivation.

In time it will be likely to rival the other soils of the State in productiveness. The formation is of peat, decayed vegetable matter, underlain by clay.

Geology. The northwest corner of the State is Archean, and its east-central portion was once occupied by a large island. These areas now consist of granites and gneisses, which also have been uncovered in the upper valley of the Minnesota River, where there are valuable granite quarries. Shore deposits and lava flows of the earliest age of the Huronian period outcrop in the old lands, cutting into the latter in deep tongues and bands, some of which contain iron-bearing beds of great wealth. The broad Huronian belt, extending southwestward from the Minnesota River, contains the Sioux quartzite, a most beautiful and valuable building stone, and beds of ancient red mud, changed by heat into the far-famed red pipestone of the Indians. The Lake Superior slope is underlain by what is known as Cambrian sandstone, or that formed during the first age of the third period; and the Ordovician rocks, the creation of which immediately followed the Cambrian, occur in the southeastern part of the State. These rocks, referred to as St. Peter sandstone and Trenton limestone, make a combination that has given rise to the bluffs along this part of the Mississippi and to the Falls of St. Anthony. Silurian rocks occur in the valley of the Red River and in some of the southeastern counties, and slight deposits of the Cretaceous are found in various parts of the State. In the Pleistocene came the great ice invasion that, in three successive waves, swept over the northern part of the United States and is most largely responsible for the present surface. The State was almost entirely covered by ice by the first two of these waves, but in the third epoch two great lines of ice met at the centre of the State and flowed southward in a tongue to Iowa.

Mining. The importance of Minnesota as a mineral producer, ranking ninth among the States, comes almost entirely from its iron mines. In its output of iron ore Minnesota far outranks all the other States and contributes both in quantity and value considerably more than half of the iron ore produced and marketed in the United States. By far the largest part of the production is from the Mesabi Range, now the most important iron-producing district in the world. It lies entirely within Minnesota and is the youngest of the great iron ranges. It was opened in 1892 with a production in that year of less than 30,000 tons; in 1894 it produced nearly 2,000,000 tons, in 1902 over 13,000,000 tons, or nearly one-half of the total output of Lake Superior iron ore, and reached its highest producing point in 1913 with 36,378,671 long tons. The Vermilion Range, of the older producing districts, is also entirely within the State, but its production in 1913 (1,536,115 tons) was not quite 5 per cent of the output of the Mesabi Range. Its maximum production was attained in 1902—a total of 2,057,273 tons. The iron-ore production is primarily the output of St. Louis County, whose production approximates 75 per cent of the total output. The iron ore produced in 1913 was 38,658,793 long tons. The production marketed in 1913 was valued at $80,789,025.

Exclusive of iron ore, the value of the mineral products in 1913 was $5,025,508. Of these less important industries the principal products were from the quarries and clay pits, and these were almost equal in value. In 1913 the clay products, exclusive of pottery, were valued at $1,781,017 and the stone products at $1,952,686. The chief quarry products are granite, limestone, and sandstone, while the principal clay product is common brick, with smaller quantities of sewer pipe, fireproofing, front brick, drain tile, pottery, etc. The other commercial products are cement, feldspar, occasional gems, lime, mineral waters, sand and gravel, and sand-lime brick. The total value of the mineral products in 1913 was $85,814,533.

Agriculture. Over one-half of the entire land area is in farms, the proportion of farm land showing a gradual increase from the northern to the southern part of the State. Of an approximate land area of 51,749,120 acres, in 1910, 27,675,823 acres were in farms, of which there numbered 156,137. The improved land in farms amounted to 19,643,533 acres. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was in 1910, $1,476,411,737. Of the total number of farms in 1910, 79 per cent were operated by owners and managers. The percentage operated by tenants is, however, steadily increasing, having been in 1880, 9.1 per cent, in 1890, 12.9 per cent, in 1900, 17.3 per cent, and in 1910, 21 per cent. In 1910 more than 70 per cent of the farms in Minnesota were at least 100 acres in size.

The native white farmers in 1910 numbered 74,710 and the foreign-born white farmers 81,134. Negro and other nonwhite farmers numbered 293. It will be noted that Minnesota is one of the few States in which the foreign-born white farmers outnumber the native white. Of the foreign-born farmers, 22,011 were born in Germany.

The following table shows the acreage, production, and value of important crops as estimated by the United States Department of Agriculture in 1914. The total value of crops in 1909 was $193,451,000, and the combined acreage was 14,731,464, representing 75 per cent of the total improved land in farms. The general character of agriculture is indicated by the fact that about three-fourths of the total value of crops in 1909 was contributed by the cereals and about one-eighth by hay and forage. The remainder, representing 13.4 per cent of the total value, consisted mostly of potatoes and other vegetables and of forest products. The

PRODUCTS	Acreage	Prod. bu.	Value
Corn	2,600,000	91,000,000	$47,320,000
Wheat	4,050,000	42,975,000	43,834,000
Oats	3,040,000	85,120,000	34,048,000
Barley	1,378,000	31,694,000	16,798,000
Rye	279,000	5,245,000	4,668,000
Potatoes	270,000	30,780,000	9,850,000
Hay	1,743,000	*3,294,000	20,093,000
Flaxseed	315,000	2,930,000	3,750,000

* Tons.

production of wheat in 1909 amounted to 57,094,412 bushels, valued at $56,007,435. The acreage devoted to this crop was 3,276,911. Oats, the second important crop, had an acreage of 2,977,258 in 1909, the production amounting to 93,897,717 bushels, valued at $34,023,389. Corn and hay and forage came next, with productions of 67,897,051 bushels and 6,036,747 tons, valued at $30,510,145 and $26,724,801 respectively. The acreage was 2,004,068 and 3,946,072 respectively.

The total acreage of potatoes and other vegetables in 1909 was 269,713 and their value was $11,044,391. Excluding potatoes, the acreage of vegetables was 46,021 and their value $3,359,000.

The soils in several portions are admirably adapted to the growing of apples, and these are the most important of the orchard fruits produced. There were grown, in 1909, 1,044,156 bushels, valued at $769,114. Orchard fruits next in importance were plums and prunes. The total value of orchard fruits in the year named was $801,112. In addition to this there were grown 293,805 pounds of grapes, valued at $11,021. The most important of the small fruits is the strawberry, of which 2,730,099 quarts, valued at $268,772, were grown in 1909. The growing of sugar beets is an industry of some importance. There were devoted to this product, in 1909, 2238 acres, and the product was 24,140 tons, valued at $118,625.

Live Stock and Dairy Products. The total value of live stock on the farms in 1910 was $156,771,855. The cattle on the farms on Jan. 1, 1915, according to the estimates of the United States Department of Agriculture were as follows: cattle other than milch cows, 1,208,000, valued at $29,838,000; milch cows, 1,186,000, valued at $63,451,000; horses, 872,000, valued at $101,152,000; sheep, 564,000, valued at $2,594,000; swine, 1,716,000, valued at $21,450,000; mules, 6000, valued at $744,000. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $29,219,406. The milk sold amounted to 53,181,785 gallons, valued at $6,146,512. Butter made amounted to 34,708,669 pounds, valued at $8,593,233. The number of all fowls on the farms in 1910 was 10,697,000, valued at $4,646,960.

Fisheries. In 1908 there were 934 persons engaged in fisheries, the capital invested was $129,000, and the value of products, $192,000. The products present a large variety, but lake herring, German carp, buffalo fish, and catfish are the principal species caught.

Forest Products. The production of rough lumber (in which it ranked twelfth among the States) in 1909 was 1,561,508 M feet B. M. The production of lath was 478,008 M in 1909, and that of shingles, 74,818 M. Of the total output of lumber very nearly five-sixths was white pine, Minnesota supplying slightly more than one-third of the total quantity of this variety of lumber produced in continental United States in 1909. The most important of the other varieties of lumber cut were spruce, tamarack, and hemlock. Minnesota is the leading State in the production of lath, with 12.9 per cent of the total for the United States in 1909. In addition to the foregoing, there were produced on the farms in 1909 forest products valued at $5,181,508.

Manufactures. Minnesota is of less importance as a manufacturing than as an agricultural State. Its large mineral output contributes little to its manufactures, as most of the products are shipped out of the State, but its extensive forests and large wheat fields furnish raw material for the two most important industries. The value of manufactured products per capita in 1909 was $197. In that year Minnesota ranked thirteenth among the States in the gross value of products.

The table on page 749 gives the most important figures relative to manufactures in 1909 and 1904.

Minnesota is the leading State in the Union in the value of the products of flour and grist mills, contributing 15.7 per cent of the total in 1909. Its importance in this industry is due to its large production of wheat, to its advantageous geographic location, particularly with respect to the adjoining grain-growing States, and to the excellent and modern facilities afforded for handling grain both by rail and by water. In both 1904 and 1909 Minnesota ranked first in the quantity and value of its wheat-flour products milled, third in respect to its barley and oat products, and fourth in respect to its rye products. In 1909 there were produced 22,712,534 barrels of white flour, or more than one-fifth of the total output of this cereal product in the United States. Second in value of products are the industries connected with the manufacture of lumber and timber. In addition to the logging plants, these include saw mills, planing mills, and wooden packing box factories. For further statistics in regard to this industry, see *Forest Products*, above. Pork is the most important product of the meat and slaughtering industry, while butter forms the chief output of the dairies. (See *Live Stock and Dairy Products*, above.) Radical changes in the methods of agriculture and the rotation of flax with other crops have made it more profitable to raise flax, thereby stimulating the manufacture of linseed oil. The growth of this industry has been remarkable, for while in 1899 there were only three establishments manufacturing this oil and its output was valued at only $1,548,000, the output in 1909 was valued at $11,037,000. In the manufacture of malt liquors the State takes high rank. Other important industries not shown separately in the table are those engaged in the manufacture of belting and hose, leather, iron and steel, millinery and lace goods, pottery and fireclay products, and steam packing.

The total number of wage earners in 1909 was 84,767, of whom 73,259 were males. For the great majority of wage earners the usual hours of labor ranged from 54 to 60 a week, only 16.7 per cent of the total being employed in establishments where the hours were less than 54 and only 4.1 per cent in establishments where they exceeded 60 a week.

In 1909 the eight cities of over 10,000 population produced 64 per cent of the total value of manufactured products and had 66.9 per cent of the average number of wage earners. The most important manufacturing city is Minneapolis (q.v.), which had, in 1909, 26,962 wage earners and manufactured products valued at $165,404,680. The most important industries of the city are those connected with the manufacture of flour. St. Paul (q.v.) is the second city in value of manufactures. There were here, in 1909, 19,339 wage earners, and the value of its manufactured products was $58,990,025.

Transportation. The State has very favorable facilities for both water and rail transportation. St. Paul and Minneapolis form one of the most important centres for transcontinental railway traffic, while Duluth, at the west end of Lake Superior, has larger shipments by water than any other city on the Great Lakes, and ranks as one of the important ports of the United States. Transportation on the Mississippi River was formerly very important, but has decreased on account of the development of the railroads. On the St. Lawrence system, however, it has greatly increased. The availability of lake transportation has been one of the greatest factors in the development of the mining industry. The southern and western parts of the State are well supplied with railroads. The total mileage of main line in 1914 was 9002. The most important lines and their total mileages are: the Great Northern, 2100; the Chicago, Milwaukee, and St. Paul, 1230; the Northern Pacific, 1039; the Chicago and Northwestern, 650; the Chicago, St. Paul, Minneapolis, and Omaha (Chicago and Northwestern), 431; the Chicago Great Western, 399; the Minneapolis and St. Louis, 378; the Duluth, Messabe, and Northern, 363; the Duluth and Iron Range, 291; the Chicago, Rock Island, and Pacific, 236; and the Chicago, Burlington, and Quincy, 24. The State has a railroad and warehouse commission, which hears and passes judgment upon complaints. The efforts of this commission to regulate railroad rates on interstate railroads resulted in several important decisions in regard to railroad rates by the State courts and by the United States Supreme Court. For a discussion of these matters, see RAILWAY.

Banks. The first banking law of Minnesota was passed in 1858, at the first session of the Legislature; the law was amended in 1878, placing the banks under the control of the Public Examiner, who is ex-officio superintendent of banks. The law was amended and made more stringent in 1881, 1889, and 1895. Banking business in the State was unprofitable at first and all the State banks organized in 1858–68 were discontinued. In 1878 there were 17 and, in 1898, 161 banks in operation. Savings banks are regulated by the Law of 1879, which placed them under the jurisdiction of the Bank Commissioner. On Sept. 12, 1914, there were 274 national banks, with an aggregate capital of $26,121,000; surplus, $16,373,455; cash, etc., $6,491,927; loans, $214,532,714; and deposits, $218,559,741. On June 30, 1914, there were 818 State banks, with capital of $16,024,878; surplus, $5,153,878; cash, $5,709,005; loans, $135,990,834; and deposits, $146,899,883.

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	Persons engaged: Total	Persons engaged: Wage earners (average number)	Capital	Wages	Value of products	Value added by manufacture
					Expressed in thousands			
All industries	1909	5,561	104,406	84,767	$275,416	$47,471	$409,420	$127,798
	1904	4,756	83,301	69,636	184,903	35,843	307,858	97,304
Boots and shoes, including cut stock and findings	1909	18	2,949	2,664	5,729	1,290	7,568	2,633
	1904	17	1,937	1,714	2,432	719	4,170	1,538
Butter, cheese, and condensed milk	1909	784	1,971	1,184	4,752	829	25,287	2,580
	1904	771	1,563	1,041	3,305	634	12,871	1,731
Cars and general shop construction and repairs by steam-railroad companies	1909	28	8,681	8,232	13,183	5,586	12,631	6,137
	1904	24	6,139	5,767	6,961	3,300	7,380	3,664
Flour-mill and gristmill products	1909	322	6,890	4,345	38,595	2,782	139,136	14,919
	1904	363	5,733	4,481	34,857	2,651	122,059	12,998
Foundry and machine-shop products	1909	247	7,273	6,002	16,873	3,904	15,609	8,424
	1904	188	4,799	4,022	8,578	2,416	9,509	5,094
Liquors, malt	1909	65	2,238	1,653	20,733	954	10,568	8,225
	1904	76	1,368	1,035	13,552	670	6,178	4,439
Lumber and timber products	1909	525	22,304	20,704	49,128	10,918	42,353	21,488
	1904	332	21,878	20,471	34,884	10,309	42,033	24,235
Oil, linseed	1909	6	433	374	4,764	250	11,037	1,352
	1904	5	387	353	3,201	204	7,018	929
Printing and publishing	1909	950	9,078	5,641	13,905	3,507	15,982	11,886
	1904	919	7,410	4,613	8,807	2,633	11,564	8,777
Slaughtering and meat packing	1909	30	2,452	1,921	7,881	1,129	25,754	3,598
	1904	29	1,691	1,376	3,437	788	17,589	2,485

Government. The present constitution was adopted on Oct. 13, 1857, and succeeded the organic Act providing for a territorial form of government passed on March 3, 1849. Amendments to the constitution may be made by a majority of both Houses of the Legislature, becoming a part of the constitution when approved by a majority vote of the people. A convention to revise the constitution may be called whenever two-thirds of the members of each branch of the Legislature think it necessary and the

proposition shall have been favorably voted upon by the electors.

Legislative.—The Legislature consists of a Senate and a House of Representatives, which meet biennally. No session must exceed 90 legislative days. The number of members who compose the Senate and the House of Representatives is prescribed by law, but the members of the Senate shall never exceed one member for every 5000 inhabitants, and in the House of Representatives one member for every 2000 inhabitants. The House of Representatives has the sole power of impeachment. Representatives hold office for two years and Senators for four years.

Executive.—The executive power consists of a Governor, Lieutenant Governor, Secretary of State, Auditor, Treasurer, and Attorney-General. The term of the Governor and Lieutenant Governor is two years. Each must have attained the age of 25 years and have been a resident of the State for one year next preceding his election. The term of the Secretary of State, State Treasurer, and Attorney-General is two years. The term of the State Auditor is four years. The Lieutenant Governor is ex-officio president of the Senate.

Judiciary.—The judicial powers are vested in a supreme court, district courts, courts of probate, justices of the peace, and such other courts, inferior to the supreme court, as the Legislature may from time to time establish by a two-thirds vote. The supreme court consists of one Chief Justice and four associate justices, elected for a term of six years, and two commissioners appointed by the court. The State is divided into judicial districts, which are composed of contiguous territory. In each district one or more judges, as the Legislature may prescribe, are elected for a term of six years. There is a probate court in each organized county, and its judge is elected for a term of two years. Justices of the peace are elected in each county for two years.

Suffrage and Elections.—Every male person of the age of 21 years and upward who is a citizen of the United States and who has resided in the State six months next preceding any election is entitled to vote. This includes mixed and pure Indians who have adopted the customs and habits of civilization. Women may vote for school officers and members of library boards, and are eligible to hold any office pertaining to the management of schools or libraries. General elections are held biennially, on the first Tuesday after the first Monday in November, dating from 1884. In accordance with the amended election laws of 1912, a State-wide primary is held on the Tuesday seven weeks preceding any election, for the selection of party and other candidates for all elective State offices and those of cities of the first and second class. There are nonpartisan primary ballots for the judiciary and other offices. Candidates for office are chosen at primary election by voters of the several political parties and not otherwise. Candidates are limited in the character of personal expenditures incurred in connection with their campaigns, and the total of all expenses must not be above limits specified for the various offices. All campaign literature must bear the name of its author, and the inducing of persons to become or not to become candidates for office is prohibited. Wagering on elections is a violation of the law. Candidates must make itemized statement of all disbursements. Corporations are prohibited from making political contributions. The Legislature of 1911 passed an Act providing for the direct nomination of United States Senators. By a law passed in 1912, Minneapolis, St. Paul, and Duluth are required to have nonpartisan primaries for municipal officers. The Legislature of 1913 enacted a measure providing for presidential primaries, and the nonpartisan primary was extended to members of the Legislature.

Local and Municipal Government.—The Legislature may from time to time establish and organize new counties; but no new county shall contain less than 400 square miles, nor shall any county be reduced below that amount. The Legislature may organize any city into a separate county, when it has attained a population of 20,000 inhabitants, without reference to geographical extent, when a majority of the electors of the county in which such city is situated shall be in favor of a separate organization. Cities and towns have the power to adopt a home-rule charter. Cities of the first class with home-rule charters may regulate the sale of liquor in hotels.

Miscellaneous Constitutional and Statutory Provisions.—No corporation may be formed under special acts except for municipal purposes. Married women retain the same legal existence and personality as before marriage, may sue or be sued, and, with the exception of voting, receive equal protection of all their rights. Combinations to monopolize the markets for food products, or restrict the freedom of such markets, are criminal conspiracies. The sale of cigarettes in the State is forbidden. There are restrictions in the character of employment of children. The maximum hours of employment for children are 8 per day and 48 per week; for women, 10 hours per day and 58 per week for certain occupations and 9 hours per day and 54 per week for others. County boards are authorized to appropriate money to prevent the spread of tuberculosis. Five-sixths of a jury may return a verdict in civil cases after 12 hours' deliberation. There is a "blue-sky" law relating to insurance companies only. The Legislature of 1913 passed a workmen's compensation act and created a minimum-wage commission to regulate the wages of women and minors. The Legislature of 1913 also enacted a measure providing for mothers' pensions in the State. Minnesota is under local-option law.

Finance. By the constitution of 1857 the State was prohibited from incurring debts for public improvements above $250,000. An amendment adopted in 1858, however, permitted the issuing of $5,000,000 of 7 per cent bonds to lend to the railroads under guaranty of first-mortgage bonds. Less than half of these bonds were sold, the railroads defaulted the interest on their mortgage bonds, and the State acquired their property by foreclosure. The State was unable to meet the interest payment, and in 1860 the debt on these bonds was repudiated. In 1881 the obligations were resumed, when the old bonds were exchanged for new ones at the rate of 50 per cent. This gave the State a debt of $4,253,000, which was gradually reduced. In 1912 it amounted to $900,000. This consists entirely of certificates of indebtedness, held largely by the school fund. The floating debt in 1912 consisted of outstanding warrants

amounting to $445,290. The funds and investments in 1912 amounted to $30,265,400. The per capita debt in that year was 63 cents. The total receipts from all sources for the fiscal year ending July 31, 1914, amounted to $22,680,208. The disbursements for the same period amounted to $20,714,746. There was a balance at the beginning of the year of $1,842,367 and at the end of the year of $3,807,830. The chief sources of revenue are railroad taxes, general taxes, the twine plant at the State prison, and permanent trust funds.

Militia. In 1910 the males of militia age, between 18 and 44 years, numbered 491,113. The organized militia consisted, in 1914, of three regiments of infantry and one of field artillery. There were 217 officers and 2706 enlisted men.

Population. In 1910 Minnesota ranked nineteenth in population among the States. The population by decades since its organization as a Territory is as follows: 1850, 6077; 1860, 172,023; 1870, 439,706; 1880, 780,773; 1890, 1,310,285; 1900, 1,751,394; 1910, 2,075,708. The est. pop. on July 1, 1914, was 2,213,919; 1920, 2,387,125. In 1910 the population per square mile was 25.7. The urban population in places of 2500 or over was 850,294 in 1910. The native white population numbered 578,081; the foreign-born white, 543,010; and the negro, 7084. There were also 9053 of Indian parentage. Of the foreign-born white those of Swedish, German, and Norwegian origin predominated, in the order named. These three nationalities contributed about 62 per cent of the total foreign-born population, which was about equally divided among them. By sex the population was divided into 1,105,511 males and 967,197 females. Males of voting age numbered 642,069.

There were but eight cities in 1910 that had populations of 10,000 or over. These, with their populations in 1910 and as estimated in 1914, are: Minneapolis, 301,480 and 343,466; St. Paul, 214,744 and 236,766; Duluth, 78,460 and 89,331; St. Cloud, 10,600 and 11,425; Virginia, 10,473 and 13,671; Mankato, 10,365; Stillwater, 10,108; Winona, 18,583. (There were no estimates for 1914 for the last three cities named.)

Education. The high standards of education in Minnesota are reflected in the relatively small portion of illiterates. In 1910 there were 49,336 persons of 10 years of age or more who were illiterate, a proportion of 3 per cent of the entire population. Among the whites of native parentage the percentage was four-tenths of 1 per cent and among foreign-born whites 7.6 per cent. The school population, ages 6 to 20 years, in 1910 was 648,775; of this number 443,761 attended school. According to the report of the State Superintendent of Education the total enrollment in public schools in 1914 was 457,041; the total number of teachers was 16,920, of whom 7966 were in high and graded districts and 8954 in rural districts. The average monthly salary of men teachers in rural districts was $58 and of women teachers $49. The total disbursements for educational purposes in public schools in 1914 was $19,396,782. The State gives special aid to schools which maintain training and agricultural departments, and to high and graded schools, consolidated schools, and rural schools. There were, in 1914, 26 vocation training schools, in which were enrolled 2927 pupils. The Legislature of 1913 enacted a law which requires definite training of all persons who enter upon teaching in the public schools.

The Legislature of 1911 enacted a compulsory-education law which is unusually comprehensive. The same Legislature passed a law regulating prices of textbooks, which, on the vote of the district or of the school board, may be supplied free or sold at cost.

Normal schools are maintained at Winona, Mankato, St. Cloud, Moorhead, and Duluth. The total enrollment in these schools in 1914 was 4166. The University of Minnesota, which is part of the educational system of the State, is at Minneapolis. Other institutions of collegiate rank are Carleton College and St. Olaf College at Northfield, Hamline University at St. Paul, Macalester College at St. Paul, and Gustavus Adolphus College at St. Peter. These are all coeducational. Albert Lea College at Albert Lea is the only women's college. St. John's University (Roman Catholic), at Collegeville, and Augsburg Seminary, at Minneapolis, are colleges for men only.

Charities and Corrections. The charitable and correctional institutions are in the hands of the State Board of Control, created in 1901. It consists of three members appointed by the Governor and Senate for the term of six years, and has full power to manage and control the State charitable and penal institutions, with authority in financial matters in certain State schools, including those for the deaf and blind. The State institutions include asylums for the insane at Anoka, Hastings, Fergus Falls, Rochester, and St. Peter; the Institution for Feeble-Minded and Epileptic, the Institution for the Blind, and the Institution for the Deaf at Faribault; the State Public School at Owatonna; Training School for Boys at Red Wing; Training School for Girls at Sauk Centre; the State Reformatory at St. Cloud; the Penitentiary at Stillwater; the State Sanatorium, for tuberculosis, at Walker; the Inebriate Hospital at Willmar; the State Hospital for Crippled and Deformed Children at St. Paul. The total number of inmates at these institutions on July 31, 1913, was 9212. The expenditure for their maintenance was $1,860,484. A new State prison at Stillwater was erected in 1913–14. The chief industry at the prison is the manufacture of twine. The product in 1913 was 18,000,000 pounds, and the profit was $372,354. Since the twine system was established the profits have aggregated $2,158,601. The manufacture of farm machinery has also been carried on successfully in the prison. The State hospital for the care of inebriates and persons addicted to the drug habit was opened in December, 1912. The Legislature in 1911 provided for the indeterminate sentence of prisoners convicted of any crime except treason and murder, and for a State board of parole. Life imprisonment was substituted for death as a punishment for murder in the first degree.

Religion. The noteworthy characteristic of the religious situation in Minnesota is the great predominance of the Roman Catholic and the Lutheran churches. The strongest of the other denominations represented are the Methodists, Baptists, Presbyterians, Congregationalists, and Protestant Episcopalians.

History. Radisson and Groseilliers, Frenchmen, visited, probably in 1660, what is now Minnesota. About 1678 Daniel Du Luth built a fort at the mouth of the Pigeon River, on the north

shore of Lake Superior. In 1680 the Falls of St. Anthony were discovered by Louis Hennepin, a Franciscan priest. Before 1700 there were trading posts on Lake Pepin and on the Minnesota River. A part of Minnesota was included in the extensive territory ceded by France to Great Britain in 1763. In 1766 it was explored by Capt. Jonathan Carver, of Connecticut. In 1783 it became a possession of the United States. The part of the State east of the Mississippi belonged at different periods to the Territories of Indiana, Michigan, and Wisconsin, Northwest Territory, and Illinois Territory. The region west formed part of the Territories of Missouri (earlier District of Louisiana), Michigan, Wisconsin, and Iowa. The government in 1805 bargained with the Indians for tracts of land at the mouths of the St. Croix and Minnesota as sites for military posts. The exploring expedition of Lieutenant Pike in 1805 was followed by many others within the succeeding 40 years; and with an increased knowledge of the country came the first important beginning of immigration. Fort St. Anthony (Snelling) was built in 1819–21; in 1822 a clearing was made at the Falls of St. Anthony and a mill was built, and in 1823 the first steamboat ascended to the falls. The next settlements made were by a colony of Swiss, near Fort Snelling in 1827, and at Stillwater in 1843. Two years before this latter date Father Galtier had erected a log chapel a little southeast of the Falls of St. Anthony and dedicated it to St. Paul. This was the nucleus of the present city of that name. The Indian titles to the lands east of the Mississippi were not extinguished until the year 1838, and it was not until March 3, 1849, that the Territory of Minnesota was organized, with the Missouri River as its west boundary. In 1851 the Indian titles to the lands (except reservations) between the Mississippi and the Red River of the North were extinguished and immigration increased rapidly. On May 11, 1858, Minnesota was admitted as a State. The educational institutions for which the State is noted took their rise early in the history of the Territory. Hamline University, at St. Paul, was founded in 1854, and St. John's University, at Collegeville, was established three years later. In 1862 the Sioux Indians, under Little Crow, dissatisfied with the settlers' treatment of them, attacked and destroyed many of the frontier settlements. Over 500 white settlers and soldiers were killed and 25,000 people were driven from their homes. The Indians were decisively defeated at Wood Lake on Sept. 22, 1862, and after engaging in sporadic raids in 1863 were removed west of the Missouri. In spite of the horrors of Indian war, immigration continued undiminished; it was stimulated by the activity of immigration agents in the Eastern States and Europe, and was encouraged by the enactment of liberal homestead laws. From the sale of its extensive public lands the State obtained a very large school fund, which it employed in building up an admirable school system.

Minnesota was consistently Republican in State politics from 1860 to 1898, when the Democrats, Populists, and Silver Republicans defeated the Republicans and elected their candidate for Governor. The Republicans regained power in 1901 and held it until 1905, when the personal popularity of the Democratic candidate, John A. Johnson, secured his election. The Republicans, however, controlled the other State offices. Governor Johnson was reëlected for three successive terms. In 1908 he had become so prominent a national figure that he was one of the leading candidates for the Democratic presidential nomination and the delegates from Minnesota were instructed to vote for him in the National Convention.

In the presidential election of 1908 Taft carried the State with 155,416 votes compared with 109,504 for Bryan. Governor Johnson was reëlected, but died on Sept. 20, 1909, and was thereupon succeeded by Lieutenant Governor Eberhart, a Republican. Governor Eberhart was elected in 1910. In 1911 Moses E. Clapp was reëlected United States Senator.

A new primary law providing for the nomination of State officers and delegates for the National Convention went into effect in 1912. The Progressive party developed great strength in that year, and in the presidential election Roosevelt received 125,856 votes compared with 106,426 for Wilson and 64,644 for Taft.

In 1914 the Democrats regained power, electing W. S. Hammond Governor with 156,304 votes compared with 143,730 for W. E. Lee, Republican. The Progressive vote fell from 128,856 in 1912 to 3553 in 1914. The State has 12 votes in the Electoral College. The capital is St. Paul.

The following is a list of Governors of Minnesota since its organization as a territory:

TERRITORIAL

Alexander Ramsey	1849–53
Willis A. Gorman	1853–57
Samuel Medary	1857–58

STATE

Henry H. Sibley	Democrat	1858–60
Alexander Ramsey	Republican	1860–64
Stephen Miller	"	1864–66
William R. Marshall	"	1866–70
Horace Austin	"	1870–74
Cushman K. Davis	"	1874–76
John S. Pillsbury	"	1876–82
Lucius F. Hubbard	"	1882–87
Andrew R. McGill	"	1887–89
William R. Merriam	"	1889–93
Knute Nelson	"	1893–95
David M. Clough	"	1895–99
John Lind	Democrat-Populist	1899–1901
Samuel R. Van Sant	Republican	1901–05
*John A. Johnson	Democrat	1905–09
Adolph O. Eberhart	Republican	1909–15
William S. Hammond	Democrat	1915–17
Joseph A. A. Burnquist	Republican	1917–21
J. A. O. Preuss	"	1921–

* Died in office.

Bibliography. Bond, *Minnesota and its Resources* (New York, 1854); *Geological and Natural History Survey, Annual Reports and Bulletins* (St. Paul, 1873 et seq.); *United States Geological Survey, Annual Reports* (Washington, 1882 et seq.); *Minnesota Historical Society Collections*, vol. iii (St. Paul, 1880), containing bibliography; Flandrau, *History of Minnesota* (ib., 1900); McVey, *Government of Minnesota: Its History and Administration* (New York, 1901); Gilfillan, *Early Political History of Minnesota* (St. Paul, 1901); O'Brien, *Minnesota Pioneer Sketches* (Minneapolis, 1905); W. W. Folwell, *Minnesota, the North Star State* (Boston, 1908); Virtue, *Government of Minnesota* (New York, 1912); Skinner, *Story of Minnesota* (Chicago, 1914).

MINNESOTA, University of. A coeducational State institution of higher learning in Minneapolis, Minn., established by an Act of the Territorial Legislature in 1851 and confirmed by the State constitution adopted in 1857. The present charter was adopted in 1868, and the first collegiate work was begun in the following

year. Its government is vested, since the death in 1901 of the life regent, John S. Pillsbury, in a board of 12 regents, nine appointed by the Governor of the State and holding office for six years, and three ex-officio members—the Governor, the State Superintendent of Public Instruction, and the president of the university. The university comprises the following colleges, schools, and departments: 1. The Graduate School, with advanced courses in all branches. 2. The College of Science, Literature, and the Arts, offering four-year courses, largely elective, leading to the degree of bachelor of arts, courses in which the senior work is offered conjointly with the Schools of Law, Medicine, Dentistry, and Chemistry, leading to the same degree; a four-year course in arts and music, leading to the degree of bachelor of arts and music; also a four-year course in science and medicine, leading to the degree of bachelor of science. 3. The College of Engineering and the Mechanic Arts, offering five-year courses in civil, mechanical, electrical, and architectural engineering and architecture, leading to the degrees of civil, mechanical, electrical, and architectural engineer and architect. The degrees of bachelor of science in engineering and in architecture are conferred at the end of the fourth year. 4. The Department of Agriculture, embracing (*a*) the Colleges of Agriculture and Forestry, offering four-year courses, leading to the degrees of bachelor of science in agriculture, in home economics, and in forestry; (*b*) the Schools of Agriculture, offering three-year courses adapted especially to the needs and opportunities of farm boys and girls; (*c*) short courses in dairying, farm management, and traction engineering; (*d*) the experiment stations, offering research advantages; (*e*) extension work in agriculture. 5. The Law School, giving a three-year course, leading to the degree of bachelor of laws. 6. The Medical School, with a five-year course, including one year of hospital interneship, leading to the degree of doctor of medicine. 7. The College of Dentistry, with a three-year course, leading to the degree of doctor of dental surgery. 8. The College of Pharmacy, offering a two and a three year course, leading to the degrees of graduate in pharmacy and pharmaceutical chemist respectively. 9. The School of Mines, offering three five-year courses, leading to the degrees of engineer of mines, engineer of mines in geology, and metallurgical engineer. 10. The School of Analytical and Applied Chemistry, with two five-year courses, the Applied Course leading to the degree of chemical engineer, the other, offered conjointly with the College of Science, Literature, and the Arts, leading to the degrees of bachelor of arts and bachelor of science in chemistry; and a four-year course in analytical chemistry, leading to the degree of bachelor of science in chemistry. 11. The College of Education for the training of teachers and supervisors, with a two-year course, leading to the degree of bachelor of arts in education. 12. The University Extension Service, offering educational opportunities to the people of the State through (*a*) correspondence courses, (*b*) evening classes, (*c*) lecture courses, (*d*) field debates on public questions, (*e*) a reference bureau. The university also has charge of the geological and natural history survey. The degrees conferred for graduate work are the master's degree in arts, science, and pharmacy, and the doctor's degree in philosophy and medicine. No honorary degrees are conferred. The departments of law, medicine, and education require two years of collegiate preparation. In all other departments students are admitted on examination or on certificate from accredited schools of the State. Tuition ranges from $30 to $150 a year. In 1913–14 the faculty numbered 608 and the attendance was 8992, of whom 3529 were women. Of this number 4155 were of college grade, 3209 subcollegiate, and 1628 extension. The general library contained 175,000 volumes, and there were special libraries in connection with the various departments of instruction. The laboratories are extensive and well equipped. There is an herbarium with 400,000 specimens. There are dormitories for the School of Agriculture, and one dormitory accommodating 90 women on the main campus. The main university grounds comprise about 109 acres, valued at $2,000,000. The 32 buildings are valued at $3,463,000, and their equipment at about $1,805,000. The State experimental farm, located between Minneapolis and St. Paul, consists of about 420 acres, and is valued at $413,000. The buildings and equipment of the Department of Agriculture are estimated at $1,480,000. The university is supported by the income of its permanent endowment, a State tax of $\frac{23}{100}$ mill, and special legislative appropriations for support, buildings, and equipment. The gross income for 1913–14, exclusive of special appropriations, was $2,445,491. The endowment was $1,605,356.62, and the value of all the university property, $12,112,000. George Edgar Vincent has been president since April, 1911. Consult E. E. Slosson, *Great American Universities* (New York, 1910).

MINNESOTA RIVER. An affluent of the upper Mississippi (Map: Minnesota, D 6). It rises on the east slope of the Dakota foothills (Coteau des Prairies) in the northeastern part of Marshall Co., S. Dak., at an elevation of about 1896 feet above sea level. It flows southeastward to the State line, where it enters Bigstone Lake, which is 26 miles long, from 1 to 1½ miles wide, and shallow. This upper reach of the river often runs dry. The river leaves the lake at Ortonville and flows southeast to Mankato (225 miles), where it turns abruptly and thereafter flows northeast to its junction with the Mississippi, a few miles below the Falls of St. Anthony and between the cities of Minneapolis and St. Paul. Its total length is about 470 miles, and its drainage basin of 16,600 square miles extends nearly across the southern part of the State. It is by far the largest confluent of the Mississippi in Minnesota. Its chief tributaries are Pomme de Terre and Chippewa rivers from the north, and Lac qui Parle, Redwood, Cottonwood, and Blue Earth rivers from the south. It is navigable for steamers 45 miles, and at high water small vessels can ascend it 295 miles, beyond which it is obstructed by falls and rapids.

MINNEWAUKON, mĭn′nē-wą′kŏn, LAKE. The largest lake in North Dakota, more frequently known as DEVIL'S LAKE (Map: North Dakota, G 1). It is situated in the northeastern part of the State and is 40 miles long and from 2 to 12 miles broad.

MINNEWIT, PETER. See MINUIT, PETER.

MINNOW (ME. *menow*, from AS. *myne*, minnow, probably from AS. *min*, Icel. *minnr*, Goth. *minniza*, OHG. *minniro*, Ger. *minder*, Lat. *minor*, less, Gk. *μινύθειν*, *minynthein*, to lessen, Skt. *mī*, to diminish). The name popularly ap-

plied to almost any small fish. More technically it applies to members of the family Cyprinidæ, which includes the roach, dace, carp, etc.; specifically, in England, *Leuciscus phoxinus*. This is a small fish about 3 inches long, abundant in gravelly bottomed streams. It is, of course, unimportant as food except for larger fishes. In the United States the name usually belongs to various small cyprinodonts, mainly of the large genus *Notropis*, living in the lesser streams and frequently called shiners. The largest and best known of these is the golden shiner (*Notropis hudsonius*), which has a very small head, but is sometimes a foot in length. (See DACE.) These fishes are mostly bottom feeders, are oviparous, carnivorous, and devour much spawn of their own and other kinds of fishes. The top minnows are of a different group, being killifishes (q.v.) of the genus *Gambusia*, and take their name from their surface-feeding habits. Along the eastern and southern coasts the common minnow of brackish water is the mummichog (q.v.). Consult D. S. Jordan, *Fishes* (New York, 1908), and id., *Manual of the Vertebrates of the Northern United States* (11th ed., rev. and enlarged, Chicago, 1914). See Plates of CARPS AND THEIR EUROPEAN ALLIES; DACE AND MINNOWS; KILLIFISHES AND TOP MINNOWS.

MIÑO, or in Portuguese **MINHO,** mē′nyō (Lat. *Minius*). The principal river of Galicia, in northwest Spain (Map: Spain, B 1). It rises in the mountains of the Province of Lugo and flows in a southerly and southwesterly direction, forming a part of the boundary between Spain and Portugal, until it enters the Atlantic through a wide estuary. Its total length is 211 miles, for the last 25 of which it is navigable for small vessels, but it is much obstructed by reefs, islands, and shifting sand banks. Its banks are very fertile, and salmon and lamprey abound, yielding a considerable industry.

MINO′AN CIVILIZATION. See ARCHÆOLOGY, II, *Minoan, or Ægean, Period;* CNOSUS; CRETE; EVANS, SIR ARTHUR; GOURNIA.

MINO DA FIESOLE, mē′nō dä fyā′zō-lä (1431–84). A Florentine sculptor of the early Renaissance. He was born at Poppi in the Casentino valley. While employed as a stonemason at Florence he became the friend and pupil of Desiderio da Settignano. His home was at Florence, but there is documentary evidence to show that he was employed at Rome in 1454, 1463, and 1464. In 1473 he was working upon the monument to Pope Paul II, of which there are fragments in the Grotte Vaticane, under St. Peter's Church, and from 1475 to 1480 he executed various commissions under Sixtus IV. He died at Florence, July 11, 1484. His work possesses great charm and delicate finish, but is lacking in originality. Its high reputation is due to rich decoration and to a certain naïveté of expression, especially in his numerous portrait busts, which were executed under the influence of Desiderio da Settignano and are his best work. Besides these his chief works are monuments, altars, and tabernacles in the churches of Florence, Fiesole, and Rome. His most important achievements in Florence are in the church of La Badia: the monuments of Bernardo Giugni (1466) and the Margrave Hugo of Tuscany (1481). There are several tabernacles by him in Santa Croce, and in the Museo Nazionale are busts of Piero de' Medici (1453), Giuliano de' Medici, and Rinaldo della Luna (1461). One of his best works, if not his most important, belongs to his early period: the monument of Leonardo Salutate, Bishop of Fiesole (died 1466), in the cathedral of that city; it is surmounted by a fine bust. The altar in the cathedral, which is also by Mino, shows plainly the limitations of his art. A beautiful piece of Renaissance decoration is the tabernacle at Santa Maria in Trastevere, Rome, in which city are also his monument of Cardinal Forteguerri in Santa Cecilia and the monument of Francesco Tornabuoni in Santa Maria sopra Minerva, his latest Roman work and one of his happiest inspirations. His other works include busts of Niccolò Strozzi, in the Museum of Berlin, which also possesses his only female bust, that of a young girl, and San Giovannino, in the Louvre; and reliefs, including numerous Madonnas, from his altars and monuments, to be found in many museums and private collections. Consult: Semper and Barth, *Hervorragende Bildhauer-Architekten der Renaissance* (Dresden, 1880); C. C. Perkins, *Handbook of Italian Sculpture* (New York, 1883); Wilhelm Bode, *Denkmäler der renaissance Skulptur Toscanas* (Munich, 1892–1905); Angeli, *Mino da Fiesole* (Florence, 1905).

MI′NOR (Lat., less). A term in music applied to intervals and modes. (1) The interval between any note and another is named according to the number of degrees between them on the scale, both notes included. The interval between C and E is called a third; that between E and G is also a third; but these intervals are unequal, the one consisting of four semitones, the other of three; the former is therefore distinguished as a major, the latter as a minor interval. (2) There are two modes in which a musical passage may be composed. Whereas the major mode makes use of but one form of scale, which is the same whether *ascending* or *descending*, the minor mode recognizes *two* forms of scale, the *harmonic* and *melodic*. Modern music conceives a mode as a system of three fundamental chords, which contain all the tones proper to the scale of that mode. These chords are the tonic, dominant, and subdominant. Arranging the tones of the *pure* minor scale as elements of these three chords we have the following:

tonic

$$\underset{\text{subdom.}}{\underset{3}{d}-\underset{3}{f}}-\overset{3}{a}-c-\overset{3}{e}-\underset{\text{dom.}}{\underset{3}{g}-\underset{3}{b}},$$

where all three chords present themselves as *minor* (because having the *minor* third), just as the corresponding chords are *major* in the *major* mode. (See MAJOR.) Arranging these tones in this diatonic order as a *descending* scale, beginning with the highest tone of the tonic chord (e), the following results: e, d, c, b, a, g, f, e. Here we have a *pure* minor scale which is identical with the Dorian mode of the Greeks. (See GREEK MUSIC.) Comparing this *descending* minor with the *ascending* major scale, we find each to be the exact opposite of the other, thus establishing the polarity of major and minor already known to Zarlino and Tartini, but fully developed only in 1853 by Hauptmann. Where the *ascending major* has the major third (on third degree) and semisteps (3–4, 7–8) the *descending minor* has the *same* in the *same place:*

c, d, e, f, g, a, b, c.
e, d, c, b, a, g, f, e.

For practical composition, however, the scale always begins with the tonic. In the progression a, b, c, d, e, f, g, a, the whole step from 7 to 8 was found unsatisfactory to the ear, which imperatively demanded a semistep. By raising g a semistep this leading tone was obtained, but the step from 6 to 7 was augmented. It was only during the nineteenth century that this form of the minor scale a, b, c, d, e, f, g♯, a, which is known as the *harmonic* minor scale, was proclaimed as the *normal* form. Before that theorists had been afraid of the augmented second from 6 to 7 (a dissonance) and had overcome the difficulty by also raising the sixth degree a semitone, so that *ascending* the minor scale had this form: a, b, c, d, e, f♯, g♯, a, while *descending* the 7th and 6th degrees were restored to their original pitch. Thus, what is known as the *melodic* minor scale has two forms, one when ascending, the other when descending. Now, considering the *harmonic* form as the normal minor scale, modern musical theory establishes the dominant chord of both the major and minor modes as a *major* triad. Thus, the three fundamental chords of the modern minor mode present themselves as two minor triads (tonic and subdominant) and one major triad (dominant). See INTERVAL; MODES.

MINOR. In law, a person who has not attained the age of full legal capacity or the age of legal capacity with respect to the performance of certain acts. The term "minor" belongs strictly to the civil law, in which a person of full legal capacity is called major; but generally the term "minor" is used in English as synonymous with infant, under which title the statement of the general law of the subject will be found. In Scots law, minor is sometimes specifically used of an infant above the age of a pupil (12 years for females, 14 for males) and under the full age (21 years) of majority. See INFANT; PARENT AND CHILD.

MINOR, mê'nôr, JAKOB (1855–1912). An Austrian scholar in Teutonic philology and literature, born at Vienna. He studied at the universities of Vienna (1874–78) and Berlin (1878–79), became a lecturer at the former (under Scherer, 1880), in 1882–84 held a chair in the Accademia Scientifico-letteraria of Milan, and in 1884–85 was professor of the German language and literature in the University of Prague. In 1885 he was appointed professor of Germanic philology at Vienna. His numerous publications include many editions of texts, such as volumes 73 (*Fabeldichter, Satiriker, und Popularphilosophen des achtzehnten Jahrhunderts*), 145 (*Tieck und Wackenroder*), and 151 (*Das Schicksalsdrama*), with introductory essays and annotations, in the "Deutsche National-Litteratur" series, and the Archduke Ferdinand's *Speculum Vitæ Humanæ* (1889); *Neuhochdeutsche Metrik* (1893), a valuable manual of German prosody, based on lectures given at Vienna in 1882; and important works in literary history and criticism, such as *Die Schicksalstragödie in ihren Hauptvertretern* (1883), *Goethes Faust* (*I. Teil*), *Entstehungsgeschichte und Erklärung* (2 vols., 1901); and an uncompleted study of Schiller, *Schiller, sein Leben und seine Werke*, vols. i and ii (1890), ranked, so far as it extends, among the best on the subject. He also edited the works of A. W. and F. Schlegel, A. von Arnim, C. Brentano, L. Tieck, and others.

MI'NOR, LUCIAN (1802–58). An American lawyer and author, born in Louisa Co., Va. He graduated at William and Mary College in 1823 and five years later became Commonwealth attorney for his native county, an office which he held until 1852. In 1855 he was appointed professor of law in William and Mary. He wrote a part of John A. G. Davis's *Guide to Justices* (1838) and contributed the notes to Daniel Call's *Virginia Reports*. A tract of his, *Reasons for Abolishing the Liquor Traffic*, had a large sale, and after his death his *Travels in New England* were edited by James Russell Lowell for publication in the *Atlantic*.

MINOR, ROBERT CRANNELL (1840–1904). An American landscape painter, born in New York City. He studied under Díaz at Barbizon, France, and under Van Luppen and Boulanger in Antwerp, and traveled in Germany and Italy. He was elected to the Society of American Artists and the National Academy of Design. He exhibited not only in the United States, but at the Royal Academy, London, and at the salons of Paris and Antwerp. His choice of motives was restricted. He preferred subdued yet richly colored light effects, particularly the glow of sunset and the mystery of twilight, and followed Díaz in his massing of light and shade. His paintings include "Dawn," "Sundown," "The Stream," "October Days," "The Vale of Kennet," "Edge of the Wood," "Interior of the Forest," "Morning in June," "Sunrise on Lake Champlain," "Cradle of the Hudson," "Cloudy Moonlight."

MINOR BARONS. The term applied in the twelfth and thirteenth centuries in England to those tenants in chief of the King who did not receive a special summons to council and to military service, but were summoned by a general proclamation of the sheriff given in the county courts. The term was not used in England after the thirteenth century.

MINOR'CA (Sp. *Menorca*). The second largest of the Balearic Islands (q.v.). It is the easternmost of the group and lies 20 miles northeast of Majorca (Map: Spain, G 3). Area, 264 (with adjacent islets, 293) square miles. Its north half consists of rather low, rolling hills, generally arid and covered with heath; the south half is an undulating plateau cut by deep, fertile valleys. There are numerous bays on the northeast coast, in one of which is the harbor of Port Mahón (q.v.), the principal town. This harbor is one of the best in the entire Mediterranean. Though minerals are found on the island, agriculture is the chief occupation, the principal products being wine, oil, grain, flax, and sweet potatoes. Pop., 1900, 37,512; 1910, 41,939. Minorca was taken by the British in 1708 and held by them, with several intermissions, until 1802, when it was finally secured to Spain by the Treaty of Amiens. Consult: Sir C. R. Markham, *Story of Majorca and Minorca* (London, 1908); J. E. C. Flitch, *Mediterranean Moods: Footnotes of Travel in the Islands of Mallorca, Menorca, Ibiza, and Sardinia* (New York, 1911); H. W. Richmond, *Papers Relating to the Loss of Minorca in 1756* (London, 1913).

MINORCA. A class of domestic fowls resembling leghorns, but of more length of body and heavier mold. Their flesh is good for table purposes, but their chief value is as egg layers, in which they excel, producing very large white eggs. They are hardy, active in hunting for their food, and generally commendable. A Minorca cock should weigh eight pounds; a hen

six and a half pounds. This breed should be long-bodied and stand high upon strong, slate-black legs; the comb is larger than that of the leghorn; the wattles thin and pendulous; and the ear lobes pure white. Two varieties are recognized—the black and the white. In each case the color must be absolutely pure; the comb, face, and wattles bright red; eyes dark hazel or red. See Colored Plate of FOWLS, under POULTRY.

MINORIES, mī'nō-rīz, THE. A London parish and street leading northward from the Tower to Aldgate, now forming with Houndsditch the Jewish quarter of the city. The name is derived from the nuns of St. Clare, called Sorores Minores, or Minoresses. The church of the Trinity, once belonging to a nunnery of the order, still exists in the Minories.

MINORITES. See FRANCISCANS.

MINORITY REPRESENTATION. See CUMULATIVE VOTING; REPRESENTATION.

MINOR PROPHETS. A common designation for a group of 12 prophetical books in the Hebrew canon, which in the English Bible form the close of the Old Testament. It was employed as early as the time of Augustine and Rufinus, who are careful to explain that its use is occasioned by the brevity of the books and does not characterize their merit or importance. The corresponding designation, major prophets, is applied to the longer books of Isaiah, Jeremiah, Ezekiel, and Daniel. The Hebrews called this group of writings the Twelve, and this nomenclature was followed by the Greeks. (See BIBLE.) The first reference to the collection is in Ecclus. xlix, 10, a section probably written in the time of John Hyrcanus. The books included in the collection, in the order in which they are arranged in the Hebrew Bible, are Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, Malachi. This order is retained in the English Bible. In the Greek version the arrangement is as follows: Hosea, Amos, Micah, Joel, Obadiah, Jonah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, Malachi. Both arrangements no doubt were intended to be chronological. There is a general advance from the Assyrian to the Chaldæan and Persian periods. The three prophets of the Chaldæan period (Nahum, Habakkuk, Zephaniah) and the three of the Persian period (Haggai, Zechariah, Malachi) are given in the same order. On the other hand the earlier prophets seem to have formed two groups in the Greek, viz., Hosea, Amos, Micah, and Joel, Obadiah, Jonah. It is significant that of these six only the first group of three can be assigned to the Assyrian period in the light of modern criticism. It would appear, therefore, that the late books, Joel, Obadiah, and Jonah, once were appended to the others, but subsequently were copied after the prophets of the Assyrian period on account of the reference to Jonah in 2 Kings xiv. 25. The same consideration may have led to the placing of Jonah before Micah as in the Hebrew recension. For the dates of the books and further information, consult the articles upon the individual books.

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MI'NOS (Gk. Μίνως). According to Greek story, a king of Crete, son of Zeus and Europa, brother of Rhadamanthus and Sarpedon, and father of Ariadne, Deucalion, and Phædra. In the ordinary version he appears as a just and wise ruler, governing Crete and the adjacent islands three generations before the Trojan War and giving them a code of laws received from his father, Zeus. He was a powerful monarch, establishing the first fleet and clearing the Ægean of pirates. He thus exercised a sway over the Greek coast lands. After his death his reputation for justice led the gods to make him a judge in the lower world, where with Rhadamanthus and Æacus he passed sentence on the souls of the dead. In contradiction to this character is the group of legends which gather about the Minotaur, where he appears as at first depriving Poseidon of his due offering, the bull sent by the god from the sea in answer to his prayer. From this bull and Pasiphaë, wife of Minos, sprang the Minotaur (q.v.), for whose keeping Dædalus (q.v.) built for Minos the Labyrinth (q.v.). When his son Androgeos was slain by the Athenians, Minos made war upon them and compelled them to pay the tribute of seven youths and seven maidens to be food for the Minotaur, until Theseus (q.v.) released them by killing the monster. The cruel character of Minos in this legend led later writers to distinguish two kings, the elder, a son of Zeus, who was just, and his grandson, who was cruel. The recent discoveries of a splendid palace at Cnosus and the evidences of a very powerful and splendid kingdom in Crete during the Mycenæan age warrant the belief that the story of Minos contains reminiscences of an early Cretan supremacy in the Ægean. Consult H. R. Hall, *Ægean Archæology* (New York, 1915). See ARCHÆOLOGY, *Mycenæan Period;* CNOSUS; CRETE; EVANS, SIR ARTHUR; GOURNIA.

MINOT, mī'nŏt. A city and the county seat of Ward Co., N. Dak., 200 miles west-northwest of Grand Forks, on the Mouse River and on the Great Northern and Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: North Dakota, C 2). It is the seat of a State normal school and contains a public library, attractive courthouse, post office and Federal buildings, and Riverside Park, which is crossed by the river three times. Minot is a distributing centre for a wide area and is engaged in lignite coal mining, flour milling, and the manufacture of briquettes. Ample water power is available, the Mouse falling 10 feet here. The water works are owned by the city. Minot has adopted the

commission form of government. Pop., 1900, 1277; 1910, 6188; 1920, 10,476.

MINOT, Charles Sedgwick (1852–1914). An American anatomist, born at Roxbury, Mass. He graduated at Massachusetts Institute of Technology in 1872, studied biology at Leipzig, Paris, and Würzburg, and took the degree of S.D. at Harvard in 1878. At Harvard Medical School he taught from 1880 till his death, becoming James Stillman professor of comparative anatomy in 1905 and director of the anatomical laboratories in 1912. In 1912–13 he served as Harvard exchange professor at Berlin and Jena. He made important investigations and discoveries in the fields of muscular physiology, respiration, and human embryology. He was president of the American Society of Naturalists in 1894, of the American Association for the Advancement of Science in 1901, and of the Association of American Anatomists in 1904–05, and was corresponding member of various important foreign societies. Honorary degrees were conferred on him by Yale, Toronto, St. Andrews, and Oxford. In addition to many papers and monographs, his publications include: *Human Embryology* (1892), which has been translated into German and is one of the most valuable works on the subject; *A Laboratory Text-Book of Embryology* (1903; 2d ed., 1910); *Age, Growth, and Death* (1908); *Die Methode der Wissenschaft* (1913); *Modern Problems of Biology* (1913; also in French).

MINOT, George (1817–56). An American jurist, born in Haverhill, Mass. He graduated at Harvard in 1836 and at the law department of that institution in 1838, studied under Rufus Choate, and was admitted to the bar in 1839. He practiced in Boston, took high rank in his profession, and was for many years counsel for the Boston and Maine Railroad. He edited, in association with Richard Peter, Jr., eight volumes of the *United States Statutes at Large* and was sole editor of that work from 1848 to 1856. He published *A Digest of the Decisions of the Supreme Court of Massachusetts* (45 vols., with supplement, 1844–52) and edited *English Admiralty Reports* (9 vols., 1853–54).

MINOT, George Richards (1758–1802). An American jurist. He was born in Boston, graduated at Harvard in 1778, and soon afterward was admitted to the bar. From 1781 to 1791 he was clerk of the Massachusetts House of Representatives. He was secretary of the convention called to ratify the Federal Constitution. In 1792 he was appointed judge of probate for Suffolk County, in 1799 he was made Chief Justice of the Court of Common Pleas, and from 1800 until his death was judge of the Municipal Court of Boston. Besides editing three volumes of the *Collections of the Massachusetts Historical Society*, of which he was one of the founders, he published a *History of the Insurrection in Massachusetts in 1786* (1786) and a *History of Massachusetts Bay* (1798–1803). The latter work is in continuation of Hutchinson's *History of Massachusetts Bay*.

MINOT, Laurence (?1300–?52). An English lyric poet, born and bred probably in the northeast midlands of England. He was no doubt a layman. Professor Herford agrees with other scholars in thinking that Minot was probably a soldierly minstrel, who sang also at court. Minot wrote in haste, with the warlike or political events that he describes still fresh in his mind. His style is rough. He is preëminently a war poet and a patriot, full of love for a united England, though he was himself in all likelihood of Norman origin. He wrote 11 spirited political songs (in the Northern dialect) celebrating the military events of the time. They begin with the *Battle of Halidon Hill* (1333) and close with the *Capture of Guisnes* (1352). Among the best is *How Edward Came to Brabant* (1339). They exist in only one manuscript (British Museum), discovered by Tyrwhitt. The best editions are *Laurence Minot's Lieder*, edited by William Scholle, in *Quellen und Forschungen* (Strassburg, 1884), and *The Poems of Laurence Minot*, edited by Hall (Oxford, 1887).

MIN'OTAUR (Gk. Μινώταυρος, *Minōtauros*). The bull of Minos (q.v.), according to the Greek legend, son of the wife of Minos, Pasiphaë, and a bull sent by Poseidon. For it she conceived a passion which the skill of Dædalus (q.v.) enabled her to gratify. Her offspring, a human body with a bull's head, was shut up by Minos in the mysterious Labyrinth (q.v.) at Cnosus, where he was fed on human victims. Yearly (or every three or nine years, according to other versions of the story) the Athenians, who had been conquered by Minos, were compelled to send seven youths and seven maidens for this monster, till Theseus (q.v.) slew him. The origin and nature of this story have as yet received no adequate explanation, but the frescoes of the palace at Cnosus showing men and girls performing gymnastic feats upon wild bulls suggest that the origin of the legend is to be sought in dim reminiscences of the Mycenæan bull ring. Some scholars connect the Greek name Λαβύρινθος, *Labyrinth*, with Gk. λαβρύς, *labrys*, a double axe, a hieroglyphic or sacred sign of Zeus, which appears everywhere in the palace at Cnosus (consult R. H. Hall, *Ægean Archæology*, pp. 152–153, New York, 1915); in this view the Labyrinth is the Place of the Double Axe. The bull was sacred in Crete to Zeus. See Minos.

MINOT'S LEDGE. See Lighthouse.

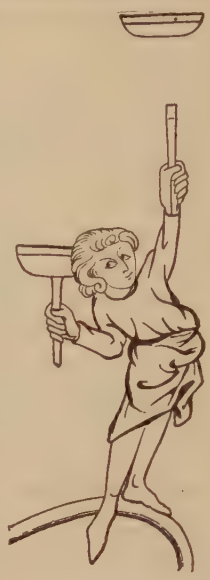
MINOTTO, Agnes Mito. See Sorma, Agnes.

MINSK, mĭnsk. A government of west Russia, in Lithuania, bounded by the Government of Vitebsk on the north, Mohilev and Tchernigov on the east, Kiev and Volhynia on the south, and Grodno and Vilna on the west (Map: Russia, C 4). Area, 35,293 square miles. The northwestern part, about one-fifth of the entire area, is somewhat elevated. It forms the watershed between the Dnieper and the Niemen. The remainder of the government is low, marshy, thickly wooded, and very sparsely inhabited, forming the larger portion of Poliessie (q.v.). Minsk is watered chiefly by the Berezina, the Pripet, and the Niemen; lakes abound in the southern part, and the climate is unhealthful. By the nature of its surface Minsk is not well fitted for agriculture, hence this industry is in a primitive state. Stock raising is favored by the abundance of pasture land. The forests, mostly pine, occupy over one-third of the total area and form one of the chief natural resources of the region. Large quantities of timber are floated to Prussia by the Berezina, the Pripet, and the canal which connects the Dnieper with the Bug, a tributary of the Vistula. Considerable quantities of wood for fuel are exported also to Kiev and used on the local railroads. The extent of this industry may be judged from the fact that about 70,000 people are employed an-

nually in the transportation of the timber down the rivers. Yeast, flour, and wooden products of all kinds are the chief manufactures. The shipbuilding industry deserves special mention. The government is traversed by two important railways, one connecting Warsaw with Moscow and the other running from the Baltic Provinces to southern Russia. Pop., 1909, 2,755,900; 1913, 2,963,700, composed chiefly of white Russians, Poles, Jews, and Lithuanians. Over 70 per cent of the population belong to the Greek Orthodox church. The government was formed out of part of the territory passing over to Russia on the second partition of Poland in 1793. It consisted till 1843 of 10 districts, but since then nine compose this government. Capital, Minsk.

MINSK. The capital of the Government of Minsk, Russia, situated in a hilly region on the Svislotch, a tributary of the Berezina, 468 miles by rail southwest of Moscow (Map: Russia, C 4). It is an old and irregularly built town, with two cathedrals, of which that of St. Catharine (1611) is especially worthy of mention. Among its educational institutions are two classical Gymnasia and one Realgymnasium, a theological seminary, a museum, and a theatre. Minsk manufactures leather, agricultural implements, soap, tobacco products, etc. The commerce is mostly in agricultural and forest products and leather. A yearly fair is held in March. Minsk is the seat of a Greek Orthodox and of a Roman Catholic bishop. The municipality maintains a pawnshop. Pop., 1904, 97,997; 1910, 105,441, of whom over 50,000 were Jews, about 21,000 Greek Orthodox, 15,000 Roman Catholics, and over 1700 Mohammedans. The town is first mentioned in 1066 as a dependency of the princes of Podolsk. After a short existence as the capital of a separate principality, it fell at the end of the twelfth century into the hands of Lithuania. In 1499 it obtained Magdeburg rights and in 1793 passed to Russia. During the Polish uprising in 1831 several engagements took place in the vicinity of the town, which is the headquarters of the Russian Fourth Army Corps.

MIN'STREL (OF. *menestrel, menesterel, menestral,* Fr. *ménestral,* It. *ministrello, menestrello,* from ML. *ministralis, ministrel,* retainer, Lat. *minister,* attendant, retainer, minister, from *minor,* less). The term first used in the late thirteenth century to designate a retainer who amused his lord with music and song. It has now come to be the generic name for the poet musician, the verse reciter, the mountebank, merry Andrew, juggler, and acrobat of the Middle Ages, as well as for certain modern entertainers. (See below.) Before the Norman Conquest the professional poet was known in England as a *scôp* (shaper or maker). "Maker" sometimes signified a poet in Shakespeare's time. The scôp shaped or composed his own poems, and chanted or sang them to the accompaniment of a rude harp. *Widsith* (i.e., Long Travel), perhaps the oldest of extant English poems (for it is earlier than the Angles' inroad of Britain), is an account of the scôp's wandering and reception among the Huns, Goths, Danes, and other peoples. For the tales he recited in the mead hall the scôp was rewarded with many treasures, including golden rings and bracelets. The scôp was not commonly a wanderer. He was rather attached to the household of some chief, by whom he was maintained, and in some cases rewarded with gifts of land. The scôp was held in great honor. He composed his poems in solitude and recited them in the hall where his master feasted. The recitation was doubtless accompanied by gesture as well as by music. The scôp was first of all a poet, differing from the modern poet mainly in the fact that he not only shaped but also recited his compositions. His theme was the glorious deeds of his chieftain or of some hero of his race. To him we are indebted for our primitive and narrative poems like *Beowulf.* The spread of Christianity in England broke up the old tribal relation and therefore the standing of the scôp was changed. In a rank much beneath the scôp were the gleemen, who, though they no doubt sometimes improvised songs and modified the matter that came to them, were satisfied for the most part to render what others had composed. They had no settled abode, but strolled far and near, earning what they could by their minstrelsy. (The accompanying illustrations, derived from mediæval manuscripts, give some notion as to the strolling minstrels' looks and demeanor.) Among their accomplishments were tumbling, ropewalking, and feats of jugglery. Some of them chewed stones or appeared to swallow knives or fire. Others had performing animals, such as bears, goats, marmots, dogs, and monkeys.



A ROPEWALKER AND JUGGLER.

The Normans brought many *jongleurs* (see JONGLEUR) and *troubadours* (q.v.) to England. The minstrels of the Middle Ages were in part descendants of the Teutonic scôpas and gleemen who took root in Gaul with the invasion of the Franks, or of those who went along with the Teuton invaders into Italy, England, and elsewhere, in part of the *mimi* and *scurræ* who had once overrun the Roman Empire. With the Celtic bards they have probably no kindred. At the battle of Hastings, Taillefer, minstrel and warrior, rode before the Norman chivalry, tossing his shield aloft, and stirring their courage with the Song of Roland, and there bravely met his death. By the fourteenth century the poet and the performer in England were usually dis-

MINSTREL WITH DRUM, FLAGEOLET, AND PERFORMING BEAR.

tinct. The scôp and the troubadour were transformed into poets like Chaucer and Gower. True, there still survived in the structure of their tales several devices of the singers, such as the address to an audience, but the audience was wholly imaginary. The gleemen and jongleurs

MINSTREL PLAYING A REBEC.

were then known as minstrels, of whom the more reputable were still held in great honor. At feasts and festivals they swarmed in great numbers with harps, fiddles, bagpipes, flutes, flageolets, citterns, and kettledrums. Such an occasion is described by Chaucer in the Squire's Tale: As Cambuskan dines, the "minstralles" play "beforn him at the bord deliciously." When he goes out he is preceded by "loude ministralcye,"

> Ther as they sownen diverse instrumentz
> That it is lyk an heven for to here.

But the decline of minstrelsy had already set in, as we know from Langland's *Piers Plowman*, the best single source of information for England. Minstrels as a class Langland severely satirized, calling them prattlers and buffoons, foul and scurrilous of speech, indeed the very children of Satan. Yet in England minstrels may have had a closer connection with genuine poets than they had on the Continent, where from the outset these sons of the Roman *mimi* and *scurrie* (cf. "scurrilous") and of the old bards of the North were abhorred by the Church. Mass and absolution were denied them; indeed, they were under perpetual excommunication and were assured that they would spend eternity at the bottom of hell. Nor had they—on the Continent, at all events—any standing before the secular law. Those who harmed them went unpunished; yet if a minstrel was ill handled he had the privilege of beating the shadow of his offender. As early as 1321 the minstrels of Paris were formed into a guild, and in 1469, in England, a guild of royal minstrels was organized, which minstrels throughout the realm were compelled to join, if they were to ply their trade (or their art) legally.

Most minstrels were itinerant; others were retained by lords as jesters. Not seldom they were women, or, at all events, women followed many a band of minstrels and lived their hard and dissolute life. The very name of minstrel was a byword, but everywhere they were welcome. After the invention of printing there was little place for the minstrel as an intermediary between author and public. He gradually found his main occupation as a ballad singer at street corners or at the wassails of the more ignorant barons. Musicians still continued, it is true, to be retained at court, and ample provision was made for their maintenance. But by an act of Parliament in the thirty-ninth year of Elizabeth's reign "ministrels abroad" were classed as "rogues and vagabonds," and were ordered to be punished as such.

In spite of new social conditions, minstrelsy was slow in dying out. George II maintained a company of 24 musicians, who were employed in the service of the Chapel Royal and in rendering odes on birthdays and New Year's. Scott, as is well known, collected the minstrelsy of the Scottish border, consisting of traditional ballads that were still recited; and in the *Lay of the Last Minstrel* is described a wandering harper who is supposed to have lived at the close of the seventeenth century. Recently, too, W. B. Yeats has discovered "the last gleeman in Ireland," a certain Michael Moran, blind almost from birth. "He was," says Yeats, "a true gleeman, being alike poet, jester, and newsman of the people."

A KING MINSTREL.
Head of a minstrel troupe.

The descendant of the old gleeman, it is said, is still not unknown in the Orkneys.

American Minstrels. Towards the beginning of the nineteenth century a new type, the Southern negro, appeared on the American stage. At first he was accepted merely as a comic character, but gradually his songs and eccentricities overshadowed his personal characteristics and he began to be looked upon as a "feature" in the performance. Before the advent of Thomas D. Rice, the reputed founder of negro minstrelsy, there had been a score of actors who, as negro comedians, had sung and danced their way into popular favor; but Rice was the first minstrel whose performance received universal recogni-

tion. His most famous character, Jim Crow, was drawn from life, its original being an old Louisville slave. In 1836 Rice went to England, where he duplicated his American successes. Individual negro minstrels now became very numerous, and in 1843 the first company, the Virginia Minstrels, was formed. It consisted of "Dan" Emmett, Frank Brower, "Billy" Whitlock, and "Dick" Pelham. The style of performance adopted by them has remained much the same ever since, for they danced, sang, played their instruments, and carried on a running dialogue of jokes. Among the more famous bands of minstrels may be mentioned: White's Kitchen Minstrels, his Virginia Serenaders, his New York Minstrels; Christy's Minstrels, which made a tremendous sensation; Bryant's Minstrels, Wood's Minstrels, and the companies formed by "Tony" Pastor, Thatcher, Primrose, Dockstader, West, Buckley, Backus, Birch, and Bailey. Minstrel performances are usually of one general character. The performers, who are always men and who number from 15 to 40, sit in a semicircle. At either end sit the "end men," or "bones," while in the middle of the line is the "interlocutor," who gravely asks his companions, especially the "end men," such questions as shall bring out their stock of jests. Each member of the troupe takes some part in the performance. The minstrel's characteristic instruments are the guitar, the banjo, tambourine, and the "bones," which are two pairs of ebony sticks, about 1 inch wide and 6 inches long, and are clapped together in the performer's fingers.

Bibliography. Wilhelm von Hertz, "Die Spielleute," an essay in his delightful *Spielmannsbuch* (2d ed., Stuttgart, 1900); Thomas Percy, *Reliques of Ancient Poetry*, vol. i (new ed., London, 1886); Joseph Ritson, *Ancient English Metrical Romances*, vol. i (ib., 1802); William Chappell, *Popular Music of the Olden Time* (2 vols., ib., 1859); Langland's *Piers Plowman* (the C text passus i and xvi, and the *Prologue* of the A text). For the scôp, consult: Henry Morley, *English Literature*, vol. ii (New York, 1888); Stopford Brooke, *English Literature from the Beginning to the Norman Conquest* (ib., 1898); Alwin Schulz, *Das Höfische Leben* (2d ed., 2 vols., Leipzig, 1889); J. J. Jusserand, *English Wayfaring Life in the Middle Ages* (4th ed., London, 1892); L. Gautier, *Epopées françaises* (2d ed., Paris, 1892), passim; W. G. Courthope, "The Decay of English Minstrelsy," in *A History of English Poetry*, vol. i (New York, 1895); E. K. Chambers, *The Mediæval Stage* (London, 1903), on the whole the most satisfactory account; Edmondstoune Duncan, *The Story of Minstrelsy* (New York, 1907), a popular historical sketch of the subject, including a useful bibliography. See also MINNESINGER; SKALD; TROUBADOURS.

MINSTREL, HENRY THE. See HENRY THE MINSTREL.

MINSTREL BOY, THE. A favorite song in Moore's *Irish Melodies*. The music is that of "The Moreen," an old Irish air.

MINT (AS. *mynet, mynit, mynyt*, from Lat. *moneta*, mint, epithet of Juno, whose temple at Rome was the mint, from *monere*, to warn). An establishment for making coins or metallic money. See MONEY.

The earliest regulations regarding the English mint belong to Anglo-Saxon times. An officer called a reeve is referred to in the laws of Canute as having some jurisdiction over it, and certain names which, in addition to that of the sovereign, appear on the Anglo-Saxon coins, seem to have been those of the moneyers, or principal officers of the mint. Besides the sovereign, barons, bishops, and the greater monasteries had their respective mints, where they exercised the right of coinage, a privilege enjoyed by the archbishops of Canterbury as late as the reign of Henry VIII and by Wolsey as Bishop of Durham and Archbishop of York.

After the Norman Conquest the officers of the royal mint became to a certain extent subject to the authority of the exchequer. Both in Saxon and Norman times there existed, under control of the principal mint in London, a number of provincial mints in different towns of England; there were no fewer than 38 in the time of Ethelred, and the last of them were only done away with in the reign of William III. The officers of the mint were formed into a corporation by a charter of Edward II; they consisted of the warden, master, comptroller, assay master, workers, coiners, and subordinates.

The seigniorage or coining charge at one time formed a considerable item in the revenues of the crown. It was a deduction made from the bullion coined, and comprehended both a charge for defraying the expense of coinage and the sovereign's profit in virtue of his prerogative. In the reign of Henry VI the seigniorage amounted to 6d. in the pound; in the reign of Edward I, 1s. 2½d. The seigniorage on gold was abolished during the reign of Charles II and has never since been exacted. The shere, or remedy, as it is now called, was an allowance for the unavoidable imperfection of the coin.

A new mint was erected on Tower Hill in 1810. In 1815 some alterations were made in the constitution of the mint, and in 1851 a complete change was introduced in the whole system of administration. The control of the mint was vested in a master and deputy master and a comptroller. The mastership, which had in the early part of the last century become a political appointment held by an adherent of the government, was restored to the position of a permanent office, the master being the ostensible executive head of the establishment. Further changes were made in the administration of the mint in 1869. The mastership was added to the duties of the Chancellor of the Exchequer, without any addition of salary, and the offices of deputy master and comptroller were amalgamated.

Colonial branches of the mint were established at Sydney in 1853, at Melbourne in 1869, and at Perth in 1899 to coin the gold so largely found in Australia, but the silver currency for the Australian Commonwealth has been imported from the Royal Mint, London. Arrangements were made for a silver coinage to be struck in the Commonwealth. A branch of the Royal Mint has been maintained at Ottawa, Canada, since 1908.

The first mint in the United States was established at Philadelphia by the Coinage Act of April 2, 1792; the first production of the new mint was the copper cent of 1793. Silver dollars were first coined in 1794 and gold eagles in 1795. In 1915 there were three coinage mints, located at Philadelphia, San Francisco, and Denver, respectively, and also a mint at New Orleans, where, however, there had been no coinage after 1909 although bullion is received

upon the same terms as at the assay offices. Assay offices are located at New York, Carson City, Helena, Boise, Charlotte, St. Louis, Deadwood, and Seattle. The Act of April 1, 1873, put all the mints and assay offices on the same footing as a bureau of the Treasury Department, under the superintendence of the Director of the Mint, who is appointed by the President for a term of five years and is subordinate to the Secretary of the Treasury. The Philadelphia mint has an engraver who supervises the manufacture of the dies used in all the United States mints.

Processes of Coining. Down to the middle of the sixteenth century little or no improvement seems to have been made in the art of coining from the time of its invention. The metal was simply hammered into slips, which were afterward cut up into squares of one size and then forged round. The required impression was given to these by placing them in turn between two dies and striking them with a hammer. As it was not easy by this method to place the dies exactly above each other, or to apply proper force, coins so made were always faulty and had the edges unfinished, which rendered them liable to be clipped. The first great step was the application of the screw, invented in 1553 by a French engraver named Brucher. The plan was found expensive at first, and it was not till 1662 that it altogether superseded the hammer in the English mint.

The following description of the method of coining money is based on a pamphlet, *Mint Processes of the United States*, issued by the Treasury Department. The processes required for converting the crude metal into money are: (1) assaying; (2) refining or parting, which reduces the material into ingots or bars of standard purity; (3) reducing the bars to coinage ingots by mixing with them the proper amount of copper alloy; (4) coining, or transforming the coinage ingots into money. The gold and silver which are brought to the mint may be in a crude or manufactured condition and are of varying degrees of fineness. The initial process, therefore, is to assay the metal, in order to determine both its value and the subsequent minting operations necessary to refine it. This process and the succeeding one of refining are described in the metallurgical articles on GOLD and SILVER and under ASSAYING. The bullion thus purified is reduced to bars, a gold bar usually weighing 400 ounces, worth about $8000. It is now ready to be used for industrial purposes, or for the next stage in the coinage process.

The consumption of gold and silver in the arts and industries is very great. During the fiscal year 1914 the Director of the United States Mint reported that gold bars for industrial use were manufactured in the various mints and assay offices, principally those of Philadelphia and New York, to the coinage value of $39,767,944. Private refineries furnished $3,455,841 more. These bars are 0.999 fine. In the same year the government institutions issued 2,033,780 fine ounces of silver bars as compared with 28,903,010 fine ounces from private refineries for use in the industrial arts. A depositor may bring crude gold bullion in any quantity, of $100 or more in value, and receive either fine gold bars or coin, at his option, a charge of not more than five cents an ounce being made for assaying and refining. For the silver alloy in the gold the owner will be paid at the market value of silver.

If the gold or silver is to be coined into money the pure bars must be mixed with copper alloy; standard coin is composed of 900 parts of gold (or silver) and 100 parts of purest copper in 1000. The law allows a slight variation from this standard, but in actual practice a single gold coin rarely varies more than 0.03 per cent from the standard, either way, and a silver coin, not more than 0.1 per cent, while the average is almost exactly correct. Weighed quantities of gold and copper, or of silver and copper, are melted together in a black-lead crucible, the molten metals thoroughly stirred together, and then poured into cast-iron molds to form ingots. These vary in size according to the denomination of the coins to be made from them. The following table gives the sizes and approximate weights of gold ingots:

DENOMINATIONS	Approximate weight in ounces	Length in inches	Thickness in inches	Width in inches
Double eagles	80	12⅝	½	1½
Eagles	62	11 11/16	½	1 3/16
Half eagles	40	12	⅛	⅞
Quarter eagles	33	12½	7/16	11/16

The ingot for silver-dollar coinage is 1⅝ inches wide, ½ inch thick, and 12½ inches long. The ingots are passed repeatedly between heavy rollers to form them into strips, a process which is called "breaking down." After each passage the rollers are screwed tighter, the amount of pressure being regulated exactly by a clock dial. Having been reduced to the proper thickness, the strips are cut into planchets by means of a steel punch working into a matrix. (See DIES AND DIE SINKING.) These planchets are now cleaned and carefully sorted, all that are not perfect or are under the standard weight being set aside to be remelted, while those that are above weight are filed down. The standard weight for gold coins is as follows: Double eagle, 516 grains; tolerance allowed by law, 0.50 grain. Eagle, 258 grains; tolerance, 0.50 grain. Half eagle, 129 grains; tolerance, 0.25 grain. Quarter eagle, 64.5 grains; tolerance, 0.25 grain.

Next comes the process of milling, or producing a raised rim around the edge of the coin, to prevent abrasion. This is accomplished in a milling machine, into which the blanks are fed automatically. The blanks rotate in a horizontal plane in a groove formed on one side by a revolving wheel and on the other by a fixed segment of corresponding groove. Each piece, as it passes through this narrow groove, has its edges forced up into an even rim. After annealing and cleaning, the coins are now ready for the final process of stamping. The planchet, fed to the press through a vertical tube, is automatically placed in a steel collar, whose inner surface is reeded to produce the fluted surface on the milled edge of the coin. Here it is firmly held while the dies close upon it

with enormous force, producing impressions on both sides of the coin. (This process and the preparatory one of engraving and stamping the dies are described under DIES AND DIE SINKING.) The pressure required to produce a clear, sharp impression on the various gold coins is as follows: double eagle, 175 tons; eagle, 120 tons; half eagle, 75 tons; quarter eagle, 40 tons. Double eagles and eagles are struck at an average rate of 80 per minute; half eagles and quarter eagles at a rate of 100 per minute. The pressure required for stamping silver coins is: dollar, 150 tons; half dollar, 110 tons; quarter dollar, 80 tons; dime, 40 tons. The first three are struck at an average rate of 80 per minute, and dimes at the rate of 100 per minute.

The total coinage of gold by the mints of the United States from 1792 to June 30, 1914, was $3,337,566,310.50.

The domestic coinage for the fiscal year 1914 in the mints of the United States amounted to 199,934,493 pieces, having a value of $36,047,386.24. The seigniorage on the coinage of silver dollars, subsidiary and minor coins during that year amounted to $5,661,266.58. (See SEIGNIORAGE.) During 1914 the coinage in the mints of the United States was: gold, $26,625,810; silver, $6,240,219.45, and minor coins of nickel and bronze, $3,181,356.79. In comparison with the coinage of the United States it may be stated that in 1913 Canada coined $1,986,480 of gold and $1,327,139 of silver; Great Britain, £27,586,817 of gold, equivalent to $134,251,245, and silver valued in United States money at $8,240,094. France in the same year coined 246,281,160 francs of gold, valued in United States money at $47,532,234, and silver valued in United States money at $4,179,250. Germany coined 143,525,760 marks in gold, valued at $34,173,483, and silver valued in United States money at $12,168,426. The total gold coinage for the world in 1913 was valued at $318,773,474, of which $3,372,866 was recoinage. The total coinage of silver in the same year was valued at $178,301,517, representing 158,557,652 fine ounces, and of this amount $21,415,372, or 19,324,926 fine ounces, was recoinage. Consult the annual reports of the Director of the Mint and also the various pamphlets on coinage issued by the Treasury Department at Washington. See COINAGE; MONEY.

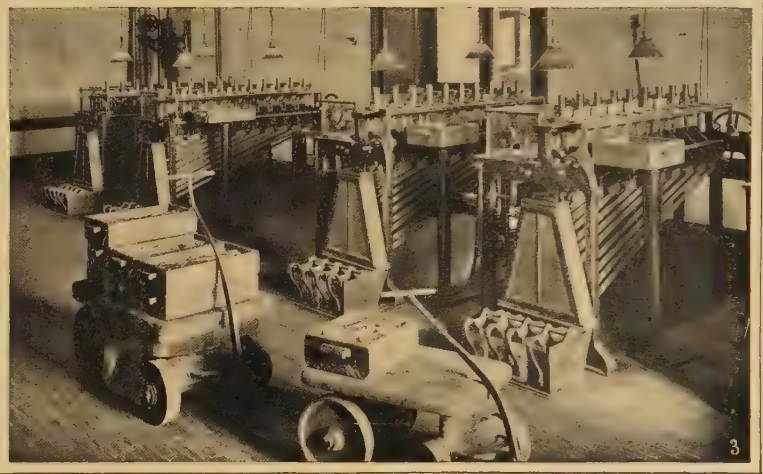
MINT (AS. *minte*, Icel. *minta*, OHG. *minza*, *munza*, Ger. *Minze*, *Münze*, from Lat. *menta*, *mentha*, from Gk. *μίνθα*, *mintha*, *μίνθη*, *minthē*, mint), *Mentha*. A genus of plants of the family Labiatæ. The species are perennial herbs, varying considerably in appearance, but all with creeping rootstocks. The flowers are whorled, the whorls often grouped in spikes or heads. The species are widely distributed over the world; some of them are very common. Water mint (*Mentha aquatica*) grows in wet grounds and ditches, and corn mint (*Mentha arvensis*), which abounds as a weed, in European fields and gardens. These and most of the other species have erect stems. All the species contain an aromatic essential oil, in virtue of which they are more or less medicinal. The most important species are spearmint, peppermint, and pennyroyal; spearmint or green mint (*Mentha spicata*), a native of almost all the temperate parts of the globe, has erect, smooth stems, from 1 foot to 2 feet high, with the whorls of flowers in loose cylindrical or oblong spikes at the top; lanceolate, acute, smooth, serrated leaves, destitute of stalk, or nearly so. It has a very agreeable odor. Peppermint (*Mentha piperita*), a plant of equally wide distribution in the temperate parts of the world, is very similar to spearmint, but has stalked leaves and flowers in short spikes, the lower whorls somewhat distant from the rest. It is very readily recognized by the peculiar pungency of its odor and of its taste. Pennyroyal (*Mentha pulegium*), also very cosmopolitan, has ovate, stalked leaves, a much-branched prostrate stem, which sends down new roots as it extends in length, and the flowers in distant globose whorls. Its smell resembles that of the other mints. All these species, in a wild state, grow in ditches or wet places. All are cultivated in gardens. The American pennyroyal is *Hedeoma pulegioides*. It grows in dry soils. Mint sauce is generally made of spearmint, which is also used for flavoring soups, etc. A kind of mint with lemon-scented leaves, called bergamot mint (*Mentha citrata*), is found in some parts of Europe, and is cultivated in gardens. Varieties of peppermint and horsemint (*Mentha longifolia*), with crisped or inflated rugose leaves, are much cultivated in Germany under the name of curled mint (*Krauseminze*); the leaves are dried and used as a domestic medicine and in poultices and warm baths. All kinds of mint may be easily propagated by division of the roots or by cuttings.

Peppermint, pennyroyal, and spearmint are used in medicine. The pharmacopœias contain an *aqua*, *spiritus*, and *oleum* of each of them, the officinal part being the leaves and stems, which should be collected when in flower. Peppermint is extensively used to flavor candy and in mixtures to cover the taste of drugs. Nearly one-half of the oil of peppermint and spearmint now used in the world is produced and distilled in Michigan, the great seat of this industry being in St. Joseph County.

MINT FAMILY. A family of plants. See LABIATÆ.

MIN'TO, GILBERT ELLIOT, first EARL OF (1751–1814). A British diplomat and administrator. He was educated in Paris and at Edinburgh and Oxford and was called to the bar in 1774. In 1776 he entered Parliament as a Whig. From 1794 to 1796 he was Viceroy of Corsica. In 1797 he was created Baron Minto, and he was Ambassador to Vienna (1799–1801). On his reappearance in the House of Lords he became an advocate of the union of Ireland with England, and afterward strenuously opposed Roman Catholic emancipation. He was Governor-General of India from 1807 to 1813; did much to suppress internal disorder in the regions under his government; annexed the island of Amboyna in 1809, the Molucca Islands in 1810, and Java in 1811; and he captured the isle of Bourbon and the island of Mauritius from the French in 1810. Consult: *The Life and Letters of Lord Minto*, edited by the Countess of Minto, his great-niece (3 vols., London, 1874); id., *Lord Minto in India* (ib., 1880).

MINTO, GILBERT JOHN, fourth EARL OF (1847–1914). A British administrator. He was educated at Eton and at Trinity College, Cambridge, and entered the Scots Guards as an ensign in 1867, resigning in 1870. He served with the Turkish army (1877), in the Afghan War (1879), and was private secretary to Sir Frederick Sleigh (afterward Earl) Roberts in Cape Colony (1881). He was a volunteer in



UNITED STATES MINT AT PHILADELPHIA

1. Coining Press 2. Milling Machines 3. Automatic Weighing Machines

1. NEW JERSEY TEA (Ceanothus Americanus).
2. SPEARMINT (Mentha spicata).
3. TALL MEADOW-RUE (Thalictrum polygamum).
4. FOUR-LEAVED MILKWEED (Asclepias quadrifolia).
5. VIRGINIA GOAT'S-BEARD (Krigia Virginica).

the Egyptian campaign conducted by Sir Garnet (afterward Field Marshal Lord) Wolseley; was military secretary to the Marquis of Lansdowne, Governor-General of Canada (1883–85); and was chief of staff to Sir Frederick Middleton during the second Riel rebellion (1885). He returned to England and in 1886 was an unsuccessful candidate for the House of Commons. Later he was Governor-General of Canada (1898–1904) and Viceroy of India (1905–10).

MINTO, WILLIAM (1845–93). An English literary critic. He was born at Alford, Scotland, and graduated at Aberdeen in 1865. He edited the London *Examiner* from 1874 to 1878 and in 1880 became professor of logic and English literature at Aberdeen. He wrote three stories, *The Crack of Doom* (1886), *The Mediation of Ralph Hardelot* (1888), and *Was she Good or Bad?* (1889), but is chiefly known as a critic. In this latter field he published many well-known works, including: *Manual of English Prose Literature, Biographical and Critical* (1872); *Characteristics of English Poets from Chaucer to Shirley* (1874); *Daniel Defoe,* for the "English Men of Letters Series" (1879). There appeared posthumously *University Extension Manual on Logic* (1893); *Plain Principles of Prose Composition* (1893); *English Literature under the Georges* (1894). Original in method, he ably defended many novel hypotheses.

MIN'TON, THOMAS (1765–1836). An English pottery manufacturer, originally an engraver, who worked for Spode in London and in 1791 established a plant of his own at Stoke-upon-Trent, where he made principally majolica and reproductions of the works of Della Robbia and Palissy. The business was continued by his son, Herbert (1793–1858), and was incorporated in 1883. During the latter half of the nineteenth century, under the artistic direction of Leon Arnoux of the old family of French potters, Minton porcelain compared favorably with that produced at Sèvres. See POTTERY; PORCELAIN.

MINUCIUS FELIX. See FELIX, MARCUS MINUCIUS.

MINUET, mĭn'ū-ĕt' (Fr., small, dim. of *menu,* from Lat. *minutus,* small, p.p. of *minuere,* to diminish, from *minor,* less; connected with Gk. *μινύς, minys,* small, Skt. *mī,* to make small, Goth. *minniza,* OHG. *minniro,* Ger. *minder,* AS., archaic Eng. *min,* less; so called because of the small steps taken in the dance). A graceful and stately dance of French origin. It is supposed to have originated in Poitou and was introduced into Paris in 1650. The first-known minuet tunes were written by Lully (q.v.) in 1653. The minuet was a favorite at the court of Louis XIV and in the reign of Charles II was carried over into England, where it continued popular until the time of George II. In Russia it flourished during the reigns of Peter the Great and Catharine II. At first the minuet was in three-quarter time and consisted of two eight-bar phrases, each of which was repeated. Mozart's minuet in *Don Giovanni* shows the form of the early dance. It was soon, however, extended by the addition of a second movement (written in three-part harmony and hence called trio) and by increasing the number of bars. Bach and Handel often introduced the minuet into their suites. Those of the former are especially famous, and Handel also used it as a concluding movement for operatic and oratorio overtures. The minuet is of particular importance because of the position it occupies in the history of the symphony, which is an evolution of the suite. Haydn was the first to employ it in the symphony, but he changed its character by quickening the time and making it vivacious rather than stately. Mozart used Haydn's form, retaining the rapid *tempo,* but gave it a tender, graceful significance. With Beethoven its history practically ceases, for he transformed it into the *scherzo,* thus making it an integral part of the symphony. Its use by later composers, Schumann, Mendelssohn, and others, is comparatively rare. See DANCING; SUITE; SYMPHONY.

MINUIT, mĭn'ū-ĭt, PETER (1580–1641). An early governor of New Netherland. He was born in Wesel, on the Rhine; was a deacon for a time in the Protestant or Walloon church there; removed to Holland early in the seventeenth century; and in December, 1625, received from the Dutch West India Company the appointment of Governor and Director General of New Netherland. He reached Manhattan Island May 4, 1626, and soon afterward purchased the island from the Indians, obtaining it for the sum of 60 guilders (about $24). He built Fort Amsterdam, defended with great courage and determination the claim of the Dutch to rightful possession of the island, and administered the affairs of his office judiciously and to the general satisfaction of the colony. The fact that the patroons were successful in establishing titles to enormous tracts of land became objectionable to the Dutch West India Company, who placed the responsibility on the shoulders of Minuit. In 1631 he was accordingly recalled by the company, and sailed for Holland in the following spring, but was driven into Plymouth, England, by a gale. Here he was charged with having prosecuted illegal trading within English dominions, and his vessel was attached on complaint made by the Council for New England. In May, however, his vessel was released. Minuit made every effort to reëstablish himself in the favor of the Dutch West India Company, but without success, and finally offered his services to the government of Sweden. Through the influence of Oxenstiern, then Chancellor, a Swedish West India Company was organized and Minuit was commissioned to establish a Swedish colony in America. He accordingly gathered together a sufficient number of Swedes and Finns for this purpose, sailed from the port of Gothenburg, Sweden, in 1637, and early in 1638 built Fort Christiana, near where the city of Wilmington, Del., now stands. The Swedish colonization scheme was bitterly opposed by the Dutch, who threw every obstacle in the way of its success, and eventually captured the colony and annexed it to their possessions in 1655. Consult Kapp, "Peter Minnewet aus Wesel," in *Historische Zeitschrift,* vol. xv (Munich, 1866), and J. J. Mickley, "Some Account of William Usselinx and Peter Minuit," in the *Delaware Historical Society Papers* (Wilmington, 1881).

MINUSINSK, mē'nu-sĕnsk'. A town of southern Siberia, in the Government of Yeniseisk, situated on the Yenisei, 300 miles southeast of Tomsk. It has a high school for girls, a good museum and library, and considerable trade in grain, cattle, and placer gold. The neighboring country is rich in coal, iron, and salt lakes. Pop., 1897, 10,255; 1911, 15,584. Minusinsk is also the capital of a district bear-

ing the same name, with an area of 43,388 square miles and a population in 1912 of 257,800.

MINUTE, mĭn'ĭt (OF., Fr. *minute,* from Lat. *minutum,* small portion, from *minuere,* to make small). A term applied to the sixtieth part of an hour and to the sixtieth part of a degree of a circle. In architecture the term "minute" is applied to the sixtieth part of the diameter of the shaft of a classic column, measured at the base; it is used as a measure to determine the proportions of the order.

MINUTEMEN. In American history, those civilians, in Massachusetts and several other colonies, who, on the approach of the Revolutionary War, pledged themselves to take the field at a minute's notice. In Massachusetts they were enrolled in pursuance of an Act of the Provincial Congress passed Nov. 23, 1774.

MINUTOLI, mê-nōō'tô-lē, HEINRICH, BARON MENU VON (1772–1846). A Prussian officer and archæologist. He was born in Geneva of an old Italian family, early entered the Prussian army, and distinguished himself in 1793 in the Rhenish campaign against France, being severely wounded at Bitsch. After his recovery Frederick William III promoted him to be major general, and in 1820 made him head of the Prussian archæological expedition to Egypt. In 1822 he was made a member of the Academy of Sciences. His valuable Egyptian collection was bought for the Berlin Museum by the King of Prussia. Minutoli's last years were spent in retirement at Lausanne. He wrote: *Ueber antike Glasmosaik* (1814), with Klaproth; the important *Reise zum Tempel des Jupiter Ammon und nach Oberägypten* (1824–27); *Ueber die Anfertigung und Nutzanwendung der färbigen Gläser bei den Alten* (1837); *Betrachungen über die Kriegskunst* (1816); *Beiträge zu einer künftigen Biographie Friedrich Wilhelm III.* (1838–44); *Der Feldzug der Verbündeten in Frankreich, 1792* (1847).

MIN'YAS (Gk. Μινύας, *Minyas*). A legendary hero connected with the Bœotian city Orchomenos (q.v.). He is called son of Poseidon in the earlier writers, but in Pausanias his father is Chryses, and he is famed for his riches and as builder of the first great treasury—really the domed tomb of Orchomenos. His fame in legend is connected with the fate of his three daughters, Leucippe (or Leuconoë), Arsippe (or Arsinoë), and Alcathoë, who, refusing to take part with the Mænads in the orgies of Dionysus, were visited by the god with Bacchic madness, in which they tore to pieces the young son of Leucippe. Their story was acted at the festival of the Agrionia, where the priest of Dionysus, with a drawn sword, pursued women of the family of the Minyadæ. The Argonauts from Iolcos in Thessaly were also called *Minyæ,* but the original connection with Minyas is very doubtful, and the statements of the ancients are obviously mere attempts to explain the identity of name. Consult Ovid, *Metamorphoses,* iv, 1 ff., 389 ff., and W. H. Roscher, *Lexikon der griechischen und römischen Mythologie,* vol. ii (Leipzig, 1890–97).

MI'OCENE EPOCH (from Gk. μείων, *meiōn,* less + καινός, *kainos,* new). A division of geologic time following the Oligocene and preceding the Pliocene epochs of the Tertiary period. It is represented along the Atlantic coast of North America by a belt of unconsolidated sands and clays that begins in Marthas Vineyard but is concealed in the interval between there and New Jersey. From that State southward to Florida the beds are continuous and also extend to the west along the Gulf coast into Texas, where they attain a thickness of 1500 feet. In the south they include compact limestones and conglomerates. In California extensive gravel beds were laid down along the streams that flowed west from the Sierras and these gravels form the so-called "deep" and "bench" gravels which are worked for gold. The coasts of California, Oregon, and Washington were still largely submerged and marine deposits were formed in that section. In the interior region are found fresh-water strata of Miocene age, including the John Day beds of eastern Oregon, which contain also volcanic tuffs and ashes and which are from 3000 to 4000 feet thick, and the Loup Fork stage of Montana, South Dakota, and the region southward as far as Mexico. Miocene time was characterized by extensive geographical changes through volcanic activity and regional upheaval. Near the close of the epoch North and South America were finally joined together by the upraising of the Isthmus of Panama, the West Indies were elevated, and the coastal lands of the United States were increased by the emergence of the belt from New Jersey to Texas. Notable changes likewise took place in Europe, such as the joining of Spain and Africa and the final severance of connection between the Mediterranean and the Indian Ocean.

The life of the Miocene included many forms of very modern aspects. Among the larger mammals are mastodons, camels, rhinoceroses, and early forms of the ruminants, from the fresh-water beds of the western region. The horse family was represented by *Protohippus* and *Hippotherium,* larger than the Eocene horses but still possessing three toes. In the marine beds are found whales, dolphins, and numerous invertebrates. Consult: "Correlation Papers—Neocene," in *United States Geological Survey, Bulletin, No. 84* (Washington, 1892); Report on "Miocene," *Maryland Geological Survey* (Baltimore, 1904); Chamberlin and Salisbury, *Geology,* vol. iii (New York, 1907). See GEOLOGY; TERTIARY SYSTEM.

MIOGA, mê-yō'gà. See ASARABACCA; GINGER.

MI'OHIP'PUS (from Eng. *mio-cene* + Gk. ἵππος, *hippos,* horse). A name sometimes used to designate the Upper Miocene stage of evolution of the horse, represented by the genus *Anchitherium.* See HORSE, FOSSIL.

MIOLAN, myô'lăn', FÉLIX. A name sometimes used by the French singer Marie Caroline Félix Carvalho (q.v.).

MIONNET, myô'nâ', THÉODORE EDME (1770–1842). A French numismatist, born in Paris, where he studied in the Collège du Cardinal le Moine and in the Ecole de Droit. After four years of legal practice and a short term in the army, from which he retired because of illness, he became assistant in 1800 in the numismatic cabinet in the Bibliothèque Nationale, and there began to catalogue the collections. He traveled in Italy, made many valuable numismatic finds, and in 1830 was elected to the Academy of Inscriptions. His great works, which still have a distinct scientific value, are *Description des médailles antiques, grecques et romaines* (17 vols., 1806–30) and *De la rareté et du prix des médailles romaines* (1815; 3d ed., 1847). Consult C. A. Walckenaer, *Notice historique sur la vie et les ouvrages de M. Mionnet* (Paris, 1846).

MIOT DE MÉLITO, myô de mâ'lē'tô', ANDRÉ

FRANÇOIS, COUNT (1762–1841). A French statesman and writer, born at Versailles. Entering the administration of the French War Department, he remained there when the Revolution broke out, although he upheld the principles of constitutional monarchy. In 1793 he was made Secretary General for Foreign Affairs and two years later was sent as French Envoy to Florence. In the following year he went to Corsica to aid Joseph Bonaparte in the pacification of that island after its evacuation by the British. Returning to Paris in 1798, he was Secretary General of the War Department and a councilor of state under the Consulate. From 1806 to 1813 he served with Joseph Bonaparte in Italy and in Spain. In 1814 he was created Comte de Mélito. He served with Napoleon during the Hundred Days and then retired from public life. His translation of Herodotus (3 vols., 1822) and Diodorus (7 vols., 1835–38) gained him admission to the French Academy. His *Mémoires sur la consulat, l'empire, et le roi Joseph* (3 vols., 1858) appeared in an English translation by Mrs. C. Hoey and J. Lillie in 1881.

MIOTICS. Those drugs which produce contraction of the pupil of the eye. They act by stimulating the terminal filaments of the third or motor oculi nerve and paralyzing the filaments of the sympathetic nerve. The principal miotics are eserine and pilocarpine, used locally by eye surgeons, and morphine, and nicotine, which produce miosis when taken internally in poisonous doses. Drugs which produce dilatation of the pupil are called mydriatics (q.v.).

MIQUEL, mē-kĕl′, JOHANNES VON (1828–1901). A German statesman, born in Neuenhaus, Hanover, of a family of French émigrés, and educated for the bar at Heidelberg and Göttingen (1846–50). In his student days he was a rabid revolutionist and something of a Socialist, but when the period of reaction set in he soon forsook his earlier sentiments. His practice in Göttingen was very successful, and in 1864 he was elected a member of the Lower House of the Hanoverian Diet and in 1865 burgomaster of Osnabrück. Removing to Berlin in 1870, he was a director of the Diskontogesellschaft until 1873, and then president of its advisory board until 1876. Then he was again made chief burgomaster of Osnabrück and in 1880 of Frankfort-on-the-Main. But his greater field of usefulness was in the Prussian House of Deputies (to which he was elected in 1867) and in the Imperial Diet (1887–90). There, as in the Prussian House of Lords, of which he was ex officio a member as chief burgomaster of Frankfort, he was a leader of the National Liberal party and one of Bismarck's most able and forceful lieutenants. In 1890 he became Prussian Minister of Finance, and was hailed as the "Emperor's man," no doubt to reassure the country in face of its fear that the new Imperial policy was to be reactionary. In this office, which Miquel held up to a few months before his death, he showed himself an able financier and a bold reformer in his attempt to liberate the Imperial treasury from depending on the contributions of the various states. As a politician he was an opportunist and sacrificed his convictions in the hope that he might be made Chancellor. But if he was unsuccessful in his programme of Imperial finance, in his more proper sphere of Prussian finance, by playing somewhat into the hands of the Agrarian party, he secured the adoption of a new tax system which greatly benefited the working classes and at the same time tremendously increased the revenue. He was ennobled in 1897. On his Prussian policy, consult Zedlitz und Neukirch, "Miquel als Finanz- und Staatsminister," in *Preussische Jahrbücher* (Berlin, 1901).

MIQUELON, mĭk′e-lŏn′ *or* mē′k'lôn′. An island near Newfoundland. See SAINT PIERRE AND MIQUELON.

MIR, mēr (Russ., OChurch Slav. *mirŭ*, union, peace, world, Lith. *mers*, Alb. *mir*, peace). The name of the civil communities of the Russian peasants. All land is held in common and is divided, usually according to the number of males at the last census, being redistributed whenever necessary. Each family receives meadow, forest, and arable land, the meadow being sometimes kept in common and only the grass divided. The mir, or village commune, as a body is assessed for taxes by the central government, and the burden of taxation is distributed among the heads of families, according to the amount of land occupied by each. Each mir is self-governing, with elected officers, and adjoining mirs may be grouped in volasts, or small cantons. The system is very old, but is gradually changing, as a mir may now go over to private ownership of land and inheritance of property on vote of two-thirds of its members. Consult Keussler, *Zur Geschichte und Kritik des bäuerlichen Gemeindebesitzes in Russland* (St. Petersburg, 1876–87), and D. M. Wallace, *Russia* (new ed., New York, 1905).

MIRABEAU, mē′rȧ′bō′, GABRIEL HONORÉ RIQUETI, COUNT DE (1749–91). A French orator and statesman. He was the second son of Victor Riqueti, Marquis de Mirabeau, a celebrated economist, and was born at Bignon, near Nemours, March 9, 1749. After several years of private instruction the young Mirabeau was placed (1767) in a fashionable military school in Paris, where he became proficient in languages and in the accomplishments of good society. In 1767 he joined the Berry cavalry regiment and the next year he received a second lieutenant's commission, but his freaks of conduct and his love affairs, one of which brought him into rivalry with his colonel, caused his imprisonment in the citadel of the island of Ré, from which he was released, at his father's request, in March, 1769. The condition of his release was that he should join the expedition to Corsica, and as a member of the Legion of Lorraine he served with credit in the subjugation of that island. In 1771 he was commissioned captain of dragoons and in 1772 he was married at Aix to Marie Emilie de Covet, only daughter of the Marquis de Marignane. Of this union one son, Victor, was born in 1773, but he died in 1778. Debts, quarrels with his father and wife, and an altercation with the Marquis de Villeneuve-Monans led to his imprisonment by *lettre de cachet* in the castle of If in 1774. Mirabeau even during his imprisonment managed to fall violently in love with the young Marquise de Monnier; trouble ensued, and he finally escaped to Switzerland, where he was joined by Sophie, as he called his mistress, and in October, 1776, they settled in Amsterdam, where Mirabeau gained a livelihood as a hack writer. In the meantime the French courts passed sentence upon the runaway lovers, who were arrested in May, 1777, and brought to

Paris, where Sophie was kept under close surveillance, while Mirabeau was imprisoned at Vincennes. For three years and a half he was kept in close confinement, but through his guard, a brother Freemason, he was able to carry on his famous correspondence with Sophie. As a prisoner he devoted himself to the translation of numerous classics and to the production of various original works, some of which were later published. After his release in December, 1780, he forsook Sophie, who, after another love affair, committed suicide in 1789. Then he returned to Pontarlier, secured the revocation of the death sentence, which had been passed on him for the seduction of Sophie, and later went to Aix, where, after a trial in which he ably conducted his own suit, he separated from his wife in 1783.

Because of his suits at Pontarlier he found it advisable to leave France for a few months, which he spent at Neuchâtel, where he met the Genevese Liberals Clavière and Duroveray and where he published his *Des lettres de cachet et des prisons d'état*, the best known of his earlier writings. From September, 1783, to August, 1784, he was in Paris, where he seems to have begun his lifelong intimacy with Henriette van Haren, a young woman of 19, known as Madame de Nehra, whose influence over Mirabeau was exerted entirely for his good. In August, 1784, he withdrew to London to allow another storm to blow over. In England he met his old schoolfellow, Sir Gilbert Elliot (later first Earl of Minto), Mr. (later Sir) Samuel Romilly, Lord Lansdowne, and other well-known men. He there wrote the *Considérations sur l'ordre de Cincinnatus*, which caused a sensation in the United States. After nine months in England the intercessions of Madame de Nehra enabled him to return to Paris, where he entered into intimate relations with the Genevese exiles and other Liberals, like Brissot, and wrote numerous pamphlets on financial questions, published during 1785. These were followed (1787–89) by his attacks on stockjobbing and his criticisms on Necker's administration of the finances. In the meantime he had twice visited Prussia, once on a secret mission for the government. On his first visit (December, 1785, to May, 1786) he was received by Frederick the Great, whose death occurred during his second visit at Berlin (July, 1786, to January, 1787). In 1787 he failed in an attempt to secure the position of Secretary to the Assembly of Notables, and his attacks on Necker drove him to take refuge in Prussia. Returning from this third visit to Berlin, he published in 1788 his most famous work, *De la monarchie prussienne sous Frédéric le Grand* (8 vols. and atlas, London, 1788).

In October, 1788, Mirabeau once more was reconciled with his father, and in January, 1789, he arrived at Aix to participate in the elections to the States-General. In April, having been rejected by his own order, the nobility, he was elected by the Third Estate both of Aix and of Marseilles to the States-General, and he chose to represent the former city. He was in Paris in time to publish on May 2, 1789, the first number of his newspaper, which, after some changes of title, finally took the name of *Courrier de Provence*, and a few days later to be present at the opening of the States-General at Versailles. He never had a following upon whom he could depend in the States-General, where his success was always a result of his ability to take advantage of temporary enthusiasm or excitement—by his fluent oratory and the power of his personality. The true greatness of Mirabeau was not revealed until the publication of his works, and especially his correspondence with La Marck, many years after his death. From the first Mirabeau saw that the royal and ministerial scheme of financial reform would be insufficient to cure the existing evils, but he thought that reforms could be successfully carried out only by a strong and moderate government. He was the most powerful supporter of the idea of a limited or constitutional monarchy. From the opening of the States-General until his death two years later Mirabeau was the most important figure in public life in France, and the story of his life is that of the Revolution in its earlier stages. He took part in the debates concerning the status of the members of the Third Estate, and his attitude as their spokesman at the royal session of June 23 marked him as the champion of the Third Estate in the struggle which ended in the reorganization of the States-General as the National Assembly. He protested vigorously against the attempt to overawe the Assembly by the mobilization of troops around Paris, but his father's death on July 13 prevented his participation in the stirring events of the following day when the Bastille was stormed and destroyed by the populace of Paris. The protracted debates on the rights of the individual, and the radical measures for the destruction of the old order taken by the Assembly on August 4, called forth his protests. Still he recognized the importance of the proposed Declaration of the Rights of Man and took an active part in framing it. One by one he brought forward his favorite constitutional measures and defended them with all his powers of logic, eloquence, and persuasion, only to see them voted down. Nevertheless, there was hardly an important law passed by the National Assembly which did not show the influence of Mirabeau's views. After the failure of his proposition to choose the royal ministers from the members of the National Assembly, on Nov. 7, 1789, Mirabeau strove earnestly to put his great abilities at the service of the King, whom he had attempted to advise as early as October 15. He tried to work with Lafayette and Necker, but everywhere he was viewed with suspicion, his advice was never followed, and his assistance was rejected entirely or accepted with ill grace. Finally in May, 1790, he abandoned his attempts to coöperate with Necker and Lafayette, and, through La Marck, entered into regular relations with the King and Queen, for whom he wrote his famous series of notes of advice. This change was marked in the Assembly by his speech in favor of the royal prerogative, especially in questions of peace and war, which directed suspicion towards him, and caused a temporary outburst of popular indignation against him. He was largely responsible for Necker's resignation in September, 1790, and for the appointment of Clavière in his place. In July he had been placed on the Diplomatic Committee of the Assembly and, in coöperation with his old friend Montmorin, the Minister of Foreign Affairs, had dealt with the perplexing questions of foreign relations, such as the annexation of Avignon and the maintenance of the Family Compact with Spain. He insisted that

no other country should interfere in the internal affairs of France; that other countries must keep their agreements with France; and that France must respect her agreements with other countries. On Nov. 30, 1790, he was elected president of the Society of the Friends of the Constitution, popularly known as the Jacobin Club, and on Jan. 29, 1791, he received the coveted honor of election as president of the National Assembly. His last note to the court, through La Marck, was sent on February 3. His last appearance in the Assembly was on March 27. On April 2, 1791, he died in the Rue de la Chaussée d'Antin in Paris. He was buried in the church of Ste. Geneviève (the Panthéon), but three years later his remains were removed to make room for those of Marat.

The greatness of Mirabeau has been generally recognized, but in estimating the details of his life and policy there has been the widest divergence of opinion. French republicans have condemned him unsparingly for his monarchical sympathies, but most of all because in return for his services the court paid his debts and supplied him with funds. In his defense it must be said that Mirabeau regarded himself as de facto prime minister, charged with the duty of saving France, a task to which he felt he alone was equal. The keynote of his advice to the court was that the King should transfer the court and the Assembly from Paris to Fontainebleau, or Compiègne, or some other small town of central France, where the influence of the mob of Paris would cease to control the Assembly and the King and the Assembly would be free to give France a strong monarchical constitution. Mirabeau had great power over men and made those who came under his fascination willing to merge their personalities in his and allow him to take all the credit for their labors. The *Souvenirs* of Etienne Dumont, one of his collaborators, first showed fully Mirabeau's methods of work and the way in which he made regular use of the services of Dumont, Reybaz, Pellenc, and even better-known persons like Clavière and the Abbé Lamourette. In Mirabeau everything was on a colossal scale; in personal appearance and moral character he was almost a monster; in intellect and powers of endurance he was a Titan. In his personality all that was noblest and best of the French Revolution seemed combined with the greatest of its characteristic evils. Some historians have mourned Mirabeau's death, because they believed that had he lived he would have saved France from the excesses of the Reign of Terror through his gift of practical statesmanship and his freedom from the doctrinaire vagaries that obsessed some of the later leaders of the Revolution.

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MIRABEAU, Sibylle Gabrielle Antoinette de Riqueti de, Comtesse de Martel de Janville. See Martel de Janville, Gabrielle, Countess.

MIR'ACLE PLAY (OF., Fr. *miracle*, from Lat. *miraculum*, miracle, from *mirari*, to wonder, from *mirus*, wonderful; connected with Gk. *μειδᾶν*, *meidan*, Skt. *smi*, to smile). Strictly, the second stage in the development of the modern drama under religious auspices, though it is sometimes confounded with the first, for which, and for a general account of this development, see Mystery. The distinction between the two, where it is made, is based on the fact that whereas the mysteries proper took their subjects from the Scripture narrative, centring about the life of Christ and the great mysteries of the Christian faith, the miracle plays were taken rather from the lives of the saints. The significant features of this change were that by getting away from the sacred text of the Scriptures greater latitude was gained and a greater range of characters; a nearer approach to a representation of contemporary life was thus also permitted, and a freer introduction of the comedy element than reverence would allow in the earlier form. Matthew Paris mentions a miracle play, *Ludus de Sancta Katharina*, that was performed at Dunstable about 1110, under the direction of a certain Geoffrey, afterward abbot of St. Albans. Again, William Fitz-Stephen, in his *Life of Thomas Becket* (about 1182), writes approvingly of London plays on

the miracles and sufferings of martyrs and confessors. Other miracle plays, based on the lives of St. Fabian, St. Sebastian, St. Botolph, St. George, and St. Crispin, were performed in the fourteenth, fifteenth, and sixteenth centuries. Very few texts of English miracle plays have been preserved; but from numerous continental specimens it may be inferred that they were in aim and structure similar to the mysteries. At the end of the nineteenth century and at the opening of the twentieth something like a revival of this dramatic form, or of this form blended with the mystery play, was attempted with some success in France, in England and Ireland, and in Germany, the efforts of Maeterlinck and Yeats being worthy of note. For bibliography, see MYSTERY.

MIRACLES (Lat. *miraculum*, wonder). An event or an effect in the physical world not explicable by known natural law and therefore assigned to a supernatural cause. Thus defined, an event which is a miracle in one age is not in another, when its natural causes have come to be understood. The conception of the direct action of the gods in certain events goes far back of the idea of natural law into the earliest history of the race. The unusual event was a wonder and challenged attention. It was naturally explained as the action of some invisible, superhuman power. The meaning of miracles still preserves the memory of this primitive conception. The next step was to regard this wonder as a sign of the presence or power of the divine being who caused it; so miracles came to be looked for especially at the shrines of the gods or on the occasion of sacrifices. The temple of Æsculapius in Greece was filled with the crutches and staffs of the lame who had been healed by the god, and religious story contains many tales of how the gods verified their presence at a sacrifice by some striking event. Aside from this, however, unexpected and startling occurrences might always be assigned to the gods. Certain classes of events which seemed to have no visible causes were quite uniformly assigned to the direct will of the gods—like thunder, which the Psalmist calls "the voice of God," and dreams, trances, and waking visions, when vivid and inexplicable. The Hebrew race shared with all the ancient world a ready belief in the abundant direct activity of God in the world. In fact, natural and supernatural is not the proper antithesis to use of ancient ideas, but rather usual and unusual, expected and unexpected. A worshiper might demand such a proof of the presence and approval of God as did Gideon in the matter of the fleece. (Judg. vi. 36–40.) The Old Testament represents, in its consideration of miracles as well as in other things, the primitive point of view. One may say that the conception of miracles, as understood by Christian theology, had not yet arisen. Dreams and their interpretation are believed to come from God, and even the life of the beasts is the direct gift of breath from God. (Ps. civ. 29, 30.) At the same time, unusual events are taken as signs from God and as verification of the words of his prophets. (1 Sam. xii. 16–18.) In this evidential use of the unusual in nature lies the beginning of the later Christian conception of a miracle as an event not explicable by natural law and having a religious purpose. The New Testament expresses various ideas of the significance of such events in its various terms for them—wonders, powers, signs, works; but the chief value of miracles to the writers of the New Testament lies in their use as evidence of the presence and power of God. Though Christ himself never based the authority of his teachings on the evidence of miracles, yet it is plain that the feeling both of the populace and of the early Church is expressed by the saying of Nicodemus: "We know that thou art a teacher come from God; for no man can do these signs which thou doest except God be with him." (John iii. 2.) The apostolic church also believed that miraculous events occurred among them and were tokens of the working of the spirit of God. (Acts xi. 15–18; 1 Cor. xii. 4–11.) Even in the subapostolic church the divine power was held to be manifested, especially in the name of Jesus. (Heitmuller, *In Namen Jesus*, Göttingen, 1903.) Clement of Rome, Irenæus, Origen, Athanasius, Augustine, and Jerome all bear witness to the belief in contemporaneous miracles. So far the belief in miracles created no particular problem, but was a natural inference from the belief in any supernatural power actively interested in the affairs of the world.

The problem of miracles arose in Christian theology in the time of the schoolmen with the sharp demarcation between the natural and the supernatural. A philosophical conception of miracle arose as that which is apart from nature. The popular interpretation was an event contrary to nature, and the popular inference was that the more opposed to nature a miracle might be, the more it was evidence of the supernatural. These ideas passed into Protestantism and have colored much of the use of miracles as Christian evidence. The Church of the Middle Ages held that miracles still took place, though some of the schoolmen, as Abelard, freely criticized accounts of particular miracles. This belief in the continuance of the power of miracle has continued in the Roman Catholic church, which has always held evidence of miraculous power to be a prerequisite to the canonization of a saint. The Protestant church has usually rejected postbiblical miracles, regarding the function of miracle to be the attestation of the divine truth of the special revelation of God in the biblical periods.

In the history of the discussion, different definitions of miracle have been given.

1. That it is a violation of a law of nature by a volition of the Deity. This is the definition which Hume used. Hume's famous argument against miracles is that all knowledge rests upon experience; but experience confirms the order of nature, and miracles are so contrary to all experience that it is more reasonable to disbelieve any testimony about them than to believe a miracle. John Stuart Mill, *Essays on Theism*, asserts that, if a miracle could happen, it would be impossible to prove it. The common answer to this position has been that the possibility of events is not limited to usual past experience, and therefore that it is impossible to prove that miracles cannot take place. Spinoza held that "nothing happens in nature which is in contradiction to its universal laws," and, since miracles are contradictions to law, they are impossible. This has been met by saying that miracles are contrary to nature only if nature is taken as a mechanism.

2. The definition of a miracle as contrary to nature is neither biblical nor in accord with the best theological thinking. Augustine held that

miracles are not against nature, but only against nature as we know it. Miracles have been defined as events not explained by the known laws of nature. It is in accordance with this that various fields, once considered miraculous, have been removed from the field of miracle by the fuller understanding of natural law—dreams, the thunder, eclipses, trances and visions, many kinds of healings. This definition admits the reality of the biblical miracles and says that, if we knew the laws of nature better, we should doubtless find explanation for them all. This position is sometimes taken from a religious point of view, conceiving that an all-wise God, in constructing the universe, must have so arranged things that all events which happen fall into their place as parts of an ordered and harmonious whole.

3. An element of religious purpose has nearly always entered into the Christian definition of miracles. A mere wonder is not a miracle. It must have a religious significance. If, to use Arnold's illustration, the pen should turn into the penwiper, it would be a very strange event, but its religious significance is not obvious, and it would not be a miracle. On the other hand, if the crossing of the Red Sea were effected by means of a wind, at the will of God, for a religious purpose, it would still be a miracle. Whenever God so orders affairs that an extraordinary event fulfills a religious purpose in life, that event may be called miraculous, even if its immediate cause is the operation of natural law.

4. A definition of miracle is sometimes given which extends it beyond the biblical miracles, or those in ecclesiastical history, to all direct spiritual action of God. Miracle is God's direct action in the world of matter or of mind. On this basis it is held that the Christian religion is miraculous, not merely because of events in Christ's life, but because it is the field of the direct action of God. Conversion, the life of prayer, the communion of God with man, the grace which enables man to combat sin, are all miraculous. It is certainly true that the historic doctrines of grace and redemption make Christianity an essentially miraculous religion.

In the modern world there have been two stages of the discussion of miracles: one under the influence of the growing sense of a natural order, which produced the objections to miracles raised by the English deists, Hume, and the French and German rationalists; the other under the influence of the modern scientific conception of the uniformity of law, expressed by the doctrine of evolution and the historical study of religion. The older objections of Hume and his contemporaries are no longer of importance. The conceptions upon which both these objections and the answers rest have been displaced by modern science. The insight into the inexhaustible complexity of nature has made men more modest in asserting what may or may not be possible, or to be sure that all the causes of any event have come into view. At the same time the sense of an ordered universe has become stronger, and the older idea of a miracle as the action of God thrusting His hand into the moving machinery of His world seems to debase the conception of God. A growing spiritual sense has also led to the emphasis on the moral and religious as evidence of the revelation and power of God. The value of miracles as evidences of the divine character of the biblical revelation because they were events only explicable by the power of God has been very much diminished. Miracles merely as acts of power have no religious significance. They are external; modern religion demands evidences within the personal experience. The result is that, while 100 years ago miracles were considered one of the great proofs of the Christian religion, they are to-day rather burdens than helps. Theology holds the possibility of miracles; for the most part it holds that some at least of the biblical miracles happened; it holds that they were evidences for religion at the time they occurred, but that they belong to the lower grade of evidences, and that the moral and spiritual proofs of religion are higher and more valuable.

But to assert that miracles may happen is not to claim that they did happen. The critical study of the Bible has introduced a new problem: how far are the narratives of miracle in the Bible to be taken as statements of fact? Certain classes of miracles will be set aside: those in books held to be fiction; those in apocalyptic literature, where miraculous visions are a part of the literary form; those told in legendary folk tales; and those where a miraculous cause is assigned for what we now see may have been a natural event. The principles of criticism must be allowed the same play in the New Testament as in the Old, but the nearly contemporaneous character of the writing of the New Testament and the abundant evidence they contain of belief in a large body of miraculous healings forbid the treatment of them as wholly legend. Many who are critical of the Old Testament narratives and of certain accounts in the New yet hold that Christ had a unique power which manifested itself naturally in miracles of benevolence, like healings and even raising from the dead. To such persons Christ himself is the great miracle, and his miracles are not mere wonders, but manifestations of his own character. The present tendency, however, is to remove attention from the miracles and centre it upon Christ's character. Historical criticism even claims the right to question, and if necessary to reject, the narratives of Christ's miraculous birth and resurrection without disloyalty to the essential principles of his religion; a claim, however, which is not always acknowledged by conservative theology. Christian thought is not entirely at one regarding the place of miracles in Christian belief. Some hold that the belief in miracle is a necessary and fundamental part of Christian doctrine; others that it is unessential, that it belongs to the interpretation of nature rather than to the realm of spiritual truth, and that Christian belief does not require the acceptance of miracles as the term is understood in historic theology.

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A. Row, *Christian Evidences Viewed in Relation to Modern Thought* (ib., 1877); Theodor Christlieb, *Modern Doubt and Christian Belief*, translated from the German (4th ed., Edinburgh, 1879); W. M. Taylor, *The Gospel Miracles in their Relation to Christ and Christianity* (New York, 1880); J. H. Newman, *Two Lectures on Miracles* (5th ed., London, 1881); J. J. Lias, *Are Miracles Credible?* (ib., 1883); Frederick Temple, *Relation between Religion and Science*, Bampton lectures (New York, 1884); A. B. Bruce, *The Miraculous Element in the Gospels* (ib., 1887); Eugen Müller, *Natur und Wunder ihr Gegensatz und ihre Harmonie* (Freiburg, 1892); B. F. Westcott, *The Gospel of Life* (London, 1893); A. D. White, *History of the Warfare of Science and Theology* (New York, 1896); Bormiot, *Wunder und Scheinwunder* (Regensburg, 1897); J. R. Illingworth, *Divine Immanence* (New York, 1898); Eugen Müller, *Das Wunder und die Geschichtswissenschaft* (Freiburg, 1898); G. P. Fisher, *Grounds of Theistic and Christian Belief* (rev. ed., New York, 1902); Matthew Arnold, *Literature and Dogma* (new ed., ib., 1902); Horace Bushnell, *Nature and the Supernatural* (new ed., ib., 1903); B. P. Bowne, *The Immanence of God* (Boston, 1905); J. N. Figgis, *The Gospel and Human Needs* (New York, 1910); G. A. Gordon, *Religion and Miracle* (Boston, 1910); J. M. Thompson, *Miracles in the New Testament* (New York, 1911).

MIRACLE WORKER. See GREGORY THAUMATURGUS.

MIRA DE AMESCUA, mē′rȧ dȧ ȧ-mȧs′kwȧ, ANTONIO (?1578–1644). A Spanish dramatist. Born at Guadix, he took orders, obtained a canonry in his native town, and settled in Madrid early in the seventeenth century. In 1610 he had become archdean of Guadix. He accompanied the Count of Lemos to Naples, and on his return in 1619 was appointed chaplain to the Cardinal Prince Ferdinand of Austria. He early attained distinction as a dramatist, for he is mentioned as such by Rojas Villandrando in his *Loa* (Madrid, 1604), which was written late in 1602 or early in 1603. Mira de Amescua's plays are few, but of even execution, a combination not often found among Spanish writers and one which invites comparison with Alarcón. They were influential at home and abroad. The lack of a good edition of Mira's complete works is responsible for his not being better known to-day.

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MIRAFLORES, mē′rȧ-flō′rȧs, MANUEL PANDO FERNÁNDEZ DE PINEDO MACEA Y DÁVILA, MARQUIS OF (1792–1872). A Spanish statesman and historian, holding also the title of Count of Villapaterna. He was born at Madrid, was sent as Ambassador to London in 1834, and was Ambassador at Paris in 1838–40. In 1846 he was Premier and in 1863 again filled the same office. He was Ambassador to Vienna in 1860 and was several times President of the Senate. He wrote a number of works which are of value for the political history of Spain in the nineteenth century. The most important is the *Memorias para escribir la historia de los siete primeros años del reinado de doña Isabel II* (1843). In addition to many of the most highly esteemed of the Spanish decorations for distinguished service he was Grand Officer of the French Legion of Honor. He was also elected a member of the Royal Academy of History at Madrid.

MIRAGE, mĭ-räzh′ (Fr., from *mirer*, to gaze). A phenomenon extremely common in certain localities and due to conditions existing in the atmosphere. As a result of a deviation of the rays of light caused by refraction and reflection, objects seen with the eye appear in unusual positions and often multiple or inverted. One cause of mirage, such as occurs in a desert, is a diminution of the density of the air near the surface of the earth, often produced by the radiation of heat from the earth, the denser stratum being thus placed *above* instead of, as is usually the case, below the rarer. Now, rays of light from a distant object, situated in the denser medium (i.e., a little above the earth's level), coming in a direction nearly parallel to the earth's surface, meet the rarer medium at a very obtuse angle, and (see LIGHT) instead of passing into it they are reflected back to the dense medium, the common surface of the two media acting as a mirror. The image produced by the reflected rays will appear inverted and below the real object, just as an image reflected in water appears when observed from a distance. If the object is a cloud or portion of sky, it will appear by the reflected rays as lying on the surface of the earth and bearing a strong resemblance to a sheet of water; also, as the reflecting surface is irregular and constantly varies its position, owing to the constant communication of heat to the upper stratum, the reflected image will be constantly varying and will present the appearance of a water surface ruffled by the wind. This form of mirage is of common occurrence in the arid deserts of Lower Egypt, Persia, Turkestan, etc. In the case of mirage at sea the denser layers of air are next to the surface of the water, and the reflection takes place from the rarer atmosphere above. Consequently we have the object appearing in the air suspended and inverted. Sometimes images of objects are seen not above one another, but side by side, caused by the existence of bodies of air of different densities in proximity.

In particular states of the atmosphere reflection of a portion only of the rays takes place at the surface of the dense medium, and thus double images are formed, one by reflection and the other by refraction—the first inverted and the second erect. The phenomena of mirage are frequently much more strange and complicated, the images being often much distorted and magnified and in some instances occurring at a considerable distance from the object, as in the case of a tower or church seen over the sea or a vessel over dry land, etc. The particular form of mirage known as looming is very frequently observed at sea and consists in an excessive apparent elevation of the object. Consult Müller, *Lehrbuch der kosmischen Physik* (Brunswick, 1896).

MIRAMAR, mē′rȧ-mär′. An Imperial palace and public pleasure resort on the Gulf of Triest, 6 miles northwest of Triest (q.v.).

MIRAMICHI (mĭr′ȧ-mē-shē′) **RIVER.** The

second largest river in New Brunswick, Canada. It is formed by the junction of the northwest and southwest Miramichi (Map: New Brunswick, C 2). It flows, after a course of about 100 miles, into the Bay of Miramichi, a part of the Gulf of St. Lawrence. Pine woods abounding with game line the banks of the river, which is navigable for vessels of modern size for a distance of 40 miles from its mouth. The fishing is excellent, salmon and trout abound, and there is a state fish-breeding establishment on one of the tributaries.

MIRAMÓN, mē′rȧ-mōn′, Miguel (1832–67). A Mexican general, of French descent, born in the city of Mexico. He was educated for the army and fought against the United States at Molino del Rey and Chapultepec. He saw much active service during the fifties and was promoted to be a lieutenant colonel in 1855. He was one of the leaders of the opposition to Comonfort (q.v.) in 1856 and supported Zuloaga, the representative of the clerical and reactionary party, in the movement which forced Comonfort to retire to the United States in 1858. Later in the same year he was chosen acting President by a *Junta de Notables*, but, contrary to the expectations of the junta apparently, he turned the office over to Zuloaga and assumed the conduct of the campaign against the Liberals, led by Juárez. Returning to the capital, he was again installed as acting President, exercising its duties until December, 1860, when his defeat by Juárez at Calpulalpam forced him to leave the country. He spent some time in Europe and advocated foreign interference in Mexican affairs. He reappeared in Mexico in 1866, after the announcement that the French army was to leave the country, and offered his services to Maximilian. Raising an army in the West, he joined the Emperor at Querétaro, where he was wounded during the final struggle with the republican forces. He was tried and condemned to be shot with the Emperor on June 19, 1867. As they were lined up for the execution, Maximilian insisted that Miramón should take the place of honor in the centre, as a tribute to his bravery.

MIRANDA, mē-răn′dȧ. A Portuguese poet. See Sá de Miranda, Francisco de.

MIRAN′DA, mĭ-răn′dȧ. In Shakespeare's *Tempest*, Prospero's daughter and the ladylove of Ferdinand.

MIRANDA, mē-răn′dȧ, Francisco (?1756–1816). (Miranda's own statements would indicate that he was born in 1752; his lawyer Chauveau Lagarde asserts the date was 1754; a baptismal certificate published by Blanco bears the date 1756.) A Spanish-American revolutionist, who was born in Venezuela and entered the Spanish army, rising to the rank of captain. He resigned in order to serve with the French in the United States. He was then sent to Cuba, where he engaged in illegal trade and was obliged to take refuge in Europe. The French Revolution called forth his enthusiastic admiration. He served in the French Republican army and gained the rank of major general. The defeat at Neerwinden (1793) was attributed largely to his treachery, and the suspicion led to his arraignment before the Revolutionary Tribunal, which unanimously acquitted him. Later in the same year he was again arrested and placed in prison, where he was kept without trial for a year and a half. After the fall of the Girondists he fled to England and endeavored in vain to induce William Pitt to aid him in an attempt to free Venezuela from the Spanish dominion. In 1803 he went to New York, where he found means to fit out two vessels and some 200 volunteers, with whom he sailed for South America in 1806. The great popular demonstration in his favor which he had expected was entirely lacking. In 1810 he organized another expedition and took possession of Valentia, Puerto Cabello, and nearly the whole of New Granada. Miranda organized a revolutionary government, proclaimed a constitution, made himself Vice President, and entered Carácas in triumph in April, 1812. The members of the government were not able to act in harmony. Miranda was taken prisoner by the opposition faction of revolutionists in July and shortly afterward fell into the hands of the Spanish authorities, by whom he was sent to Spain. He died in the dungeons of the Inquisition at Cadiz three years later. Consult: Biggs, *History of Miranda's Attempt in South America* (London, 1809); Marqués de Rojas, *El General Miranda* (Paris, 1884); id., *Miranda dans la révolution française* (Carácas, 1889); the Spanish edition of this latter work (ib., 1889) contains a few additional source materials; also W. S. Robertson, *Francisco de Miranda and the Revolutionizing of Spanish America* (Washington, 1909).

MIRANDOLA, mē-răn′dō-lȧ. A town in the Province of Modena, Italy, 19 miles north-northeast of the city of Modena (Map: Italy, C 2). The little town is regularly laid out. The old Ducal Palace of the Pico family, the cathedral, and the church of Gesù are the most important buildings. It has a gymnasium, a technical school, and a library. The principal industries are cattle raising and the production of silk and rice. Pop. (commune), 1901, 13,731; 1911, 16,740.

MIRANDOLA, Giovanni Pico della. An Italian humanist. See Pico della Mirandola.

MIRANHA, mĭ-răⁿ′nyȧ. See Maranha.

MIRAT, mē′rŭt. See Meerut.

MIRAVAL, mē′rȧ′vȧl′, Raimon de (c.1190–1216). A Provençal poet. His poverty compelled him to subsist on the favor of the great lords at whose courts he seems to have passed most of his time. His chief patron was Raimon VI of Toulouse, addressed in his poems by the name Audiart. Consult Andraud, *La vie et l'œuvre du troubadour Raimon de Miraval* (Paris, 1902).

MIRBACH, mēr′bäg, Julius, Count von (1839–). A German politician, born in Sorquitten, East Prussia. He studied law at Königsberg, Bonn, and Berlin and served as officer in the German army, resigning in 1865. In 1874 he entered the Prussian House of Lords and in 1878–81 and 1886–98 was a member of the Reichstag and a prominent figure in the German Conservative party, taking a foremost part in economic and agrarian reforms, acting as leader of the *Steuer-und Wirtschaftsreformer* (1879 et seq.). He was created Count in 1888.

MIRBEAU, mēr′bō′, Octave (1850–1917). A French novelist and playwright, born at Trevières (Calvados). After a stormy journalistic career he published his first novel, *Jean Marcelin*, in 1885, but gained note with *Lettres de la chaumière* (1886), a tale of his native Normandy. There followed *Le Calvaire* (1886); *L'Abbé Jules* (1888; in Russian, 1912); *Sébastien Roch* (1890); *Le jardin des supplices* (1899); the exceedingly unsavory and very

popular *Les mémoires d'une femme de chambre* (1901; in English, *Experiences of a Lady's Maid*, 1911); *Les vingt-et-un jours d'un neurasthénique* (1902); *Le jardin des supplices* (1902); *Dans l'antichambre* (1905). He was successful on the stage with *Les mauvais bergers* (1897), and still more with *Les affaires sont les affaires* (1903), produced with great success in New York in 1905 as *Business is Business*. A number of one-act plays are contained in *Farces et moralités* (1904). In 1909 he wrote *Le foyer*, which was suppressed by the censor, and in 1913 *Dingo*.

MIRBEL, mêr'bĕl', Charles François Brisseau de (1776–1854). A French botanist, born in Paris. In 1800 he began a botanical course at the Athénée and in 1803 he was made intendant of the Malmaison Gardens. In 1806 he was made a councilor of state at the Dutch court of Louis Bonaparte, and as director of fine arts he was charged with the mission of organizing a school in Paris for Dutch artists. In 1808 he became a member of the Institute. He was professor of culture at the Botanical Garden (1828) and at the Museum of Natural History (1829). His great contributions to structural botany are recorded in his works: *Traité d'anatomie et de physiologie végétale* (1802); *Exposition de la théorie de l'organisation végétale* (1809); *Eléments de botanique et de physiologie végétale* (1815); *Histoire naturelle des végétaux classés par familles* (18 vols., 1802–26).

MIRBT, mêrpt, Carl Theodor (1860–). A German Church historian, born at Gnadenfrei in Silesia. He was educated at the universities of Halle, Erlangen, and Göttingen; was docent at Göttingen for a year; and then was professor of ecclesiastical history at Marburg from 1889 to 1912, when he went back to Göttingen. His published work, which deals with the Roman Catholic church and with the history of Protestant missions, comprises: *Die Wahl Gregors VII.* (1892); *Die Publizistik im Zeitalter Gregors VII.* (1894); *Der deutsche Protestantismus und die Heidenmission im 19. Jahrhundert* (1896); *Quellen zur Geschichte des Papsttums und des römischen Katholizismus* (1895; 3d ed., 1910); *Ultramontanismus im 19. Jahrhundert* (3d ed., 1903); *Mission und Kolonialpolitik in dem deutschen Schutzgebieten* (1910); *Die Frau und die deutsche Kolonialmission* (1912); *Geschichte der katholischen Kirche von der Mitte des 18. Jahrhundert bis zum Vatikanischen Konzil* (1913).

MIRÉS, mê-râ', Jules (1809–71). A French financier and speculator. He was born at Bordeaux. In company with Moïse Millaud he began to buy up the press of Paris; he purchased the *Chemins de Fer* and afterward the *Constitutionnel* and *Le Pays*. He published independently the *Conseiller du Peuple*. Swaying public opinion in this manner, he organized the *caisse générale des chemins de fer*, or railway bank, began to build railroads in Spain and elsewhere, negotiated municipal and national loans, and acquired an immense fortune. During the last four years of his career his speculations amounted to 1,500,000,000 francs. Arrested for fraud in 1861 he was condemned to imprisonment, but was acquitted in 1862 after an appeal. He resumed banking operations, but people came to distrust his promises of magnificent possibilities. He was a man of infinite resources, quick to plan, daring to act, carrying out his immense coups by gigantic combinations, overcoming all opposition by the plentiful use of money and with the help of his hired journalists and politicians. He published in 1870 *Un crime judiciaire*, and carried on a lively war of pamphlets with his enemies.

MIRFIELD, mêr'fēld. A manufacturing town and urban district in the West Riding of Yorkshire, England, 5 miles northeast of Huddersfield, on the Calder, one of the chief railway centres in the country. It has manufactures of woolen and cotton goods, carpets, and blankets. There are coal mines near by. Pop., 1901, 11,341; 1911, 11,712.

MIR'IAM. The sister of Moses and Aaron. She is called a "prophetess" and is represented as celebrating the deliverance of the people from Egypt as the leader of a female choir (Ex. xv). Apart from this, she is mentioned again only in connection with Aaron's rebellion against Moses, in which Miriam stands on Aaron's side. She is smitten with leprosy as a punishment (Num. xii), but after seven days' isolation (Lev. xiii. 5) is healed by Yahwe at Moses' solicitation. Her death takes place at Kadesh (Num. xx. 1). Miriam, though not expressly named, is thought to be the sister referred to in the story of Moses' infancy (Ex. ii), who acts as a nurse and protector to him. The name may be connected with Merari, one of the sons of Levi (Ex. vi. 16). It has been suggested that Aaron and Miriam represent priestly families vying with that of Moses, that the latter prevailed, but that a compromise was effected, showing itself in the later tradition. The association between Moses, Aaron, and Miriam once established is supposed to have given rise to further elaboration which was adjusted to the general priestly narrative in the Pentateuch. The allusion in Micah vi. 4 to "Moses, Aaron, and Miriam" as the forerunners in the redemption of Israel is thought by some scholars to be a valuable indication of the period at which the combination of the three in popular tradition and legend had taken place.

MIRIBEL, mê'rê'bĕl', Marie François Joseph de (1831–93). A French general. He was born at Montbonnot, studied at the Ecole Polytechnique and at the Military Academy of Metz, and in 1853 was commissioned a lieutenant of artillery and sent to the Crimea. He fought in Italy in 1859 and in Mexico (1862–65); served on the international commission dealing with the use of explosive bullets; and in 1868 was appointed military attaché in St. Petersburg. Miribel fought bravely at Champigny and Buzenval in the Franco-Prussian War; commanded a corps of artillery against the Commune; and from 1877 to 1879 was chief of the general staff. His reappointment by Gambetta to this post in 1881 created great excitement, and he resigned after the fall of Gambetta's ministry. In 1888 he was commanding general of the Sixth Army Corps. In 1890 he was once more made chief of staff with greater powers than before, and showed himself an able administrator.

MIRIM, mê-rēn'. A lake or lagoon in the extreme south of Brazil, on the boundary of Uruguay (Map: America, South, D 6). It is 130 miles long and from 5 to 25 miles wide, and is separated from the Atlantic Ocean by a low sandy tract from 15 to 40 miles wide, containing several true coast lagoons. It receives a number of small rivers from the west, and,

though its shores are low and marshy, it is not in direct communication with the ocean, but discharges its waters northward into the Lagôa dos Patos (q.v.). Like the latter, it was evidently formed through the cutting off by sand bars of a large bay of the ocean. The water of Lake Mirim is fresh, and there is no rise or fall of the tides in it.

MIRITI (mê-rē′tê) **PALM.** See MAURITIA.

MIRKHOND, mêr-kŏnd′, HAMAN ED DIN (1433–98). A distinguished Persian historian, born of Sayyid descent from a Bokharan family probably near Nishapur. About 1474, under the patronage of Mir Alishir, Mirkhond began his historical work, entitled *Rauzat-us-ṣafā* (Garden of Purity). It is of great value and, on the whole, is a very remarkable compilation, being, save for the seventh volume, which deals with the latter part of the fifteenth century and must have been by Mirkhond's son, Khondamīr (1475–1535), the work of a single man. Beginning with mythical times, the *Garden* contains biographical notices of the leading Persian notables down to 1523. The part on the early kings was translated by Shea (London, 1832); that on the Sassanids, into French by S. de Sacy (Paris, 1793) and Jaubert (ib., 1843); on the Samanids, into Latin by Wilken (Berlin, 1808) and into French by Defrémery (Paris, 1845); on the Seljuks, by Vullers into German (Giessen, 1837); and the story of Mohammed by Rehatsek into English (5 vols., London, 1891–94) and from English into French by Lamairesse (Paris, 1894).

MIRMILLO′NES. The name given by the Romans to a kind of gladiator (q.v.).

MIR′ROR (OF. *mireor, mirour,* Fr. *miroir,* It. *miratore, miradore,* from Lat. *mirari,* to look, from *mirus,* wonderful; connected with Gk. *μειδᾶν, meidan,* Skt. *smi,* to smile). An object having a smooth or polished reflecting surface by which virtual or real images of an object are produced, and the direction of light or heat waves changed according to the laws of reflection. Mirrors are used largely for toilet and decorative purposes, and also in scientific apparatus and in numerous other practical devices to concentrate, scatter, or divert rays of light or heat, as in practical illumination. The action of the mirror depends on the law of reflection where it is stated that the angle of reflection must equal the angle of incidence and be in the same plane. This optical principle was well known to the ancients and was doubtless long preceded by an actual practical knowledge of the instrument. Probably for ages after the civilization of man commenced the still waters of ponds and lakes were the only mirrors. We read in the Pentateuch of mirrors of brass being used by the Hebrews, while it is known that mirrors of bronze were in very common use among the ancient Egyptians, Greeks, and Romans, and many specimens are preserved in museums. Praxiteles taught the use of polished silver for mirrors in the year 328 B.C. and polished mirrors of obsidian or natural glass were used by the Romans.

Mirrors of glass were first made at Venice in 1300; and judging from those still in existence they were very rude contrivances compared with those of modern make.

It was not until 1673 that the making of mirrors was introduced into England, and the industry has since developed in Europe and America to a point where it is a very important manufacture; and mirrors can be produced of any size to which plate glass can be cast.

For many centuries mirrors were made according to the process originally introduced at Venice—by backing a sheet of glass with an amalgam of mercury and tin. The surface was overlaid with sheets of tin foil, rubbed down smooth, and the whole covered with quicksilver, which immediately formed an amalgam with the tin. The superfluous mercury was then run off and a woolen cloth held firmly over the surface by means of iron weights. After this pressure had been continued 24 hours, more or less, the weights and cloth were removed and the glass placed on a table with a movable top, which was gradually inclined until the unamalgamated quicksilver had entirely drained away and only the surface of perfect amalgam remained adhering to the glass. This process, which was long used, was open to many objections, not least of which was its extreme unhealthfulness for the workmen. The process was also long and tedious, and at best made an unsatisfactory mirror, reflecting less than half the rays of light.

The first attempt to back the glass with silver was made by Liebig in 1836, and different solutions were proposed by other chemists, all of which produced mirrors that were satisfactory for a short time but finally became spotted. In 1855 Pettijean patented a process which, with various modifications, is the one now in general use. The method of mirror manufacture common in America may be described as follows: The raw stock or plain plate glass reaches the factory carefully packed in cases of immense size. The glass is first thoroughly inspected and all defects marked. It then goes to the cutters' department, where it is cut into the proper sizes. Thence it is moved to the beveling department, where it is beveled and polished on rapidly revolving emery wheels of varying degrees of smoothness, the plates—some of them of enormous size—being lightly held against the wheel by the workmen. After both surfaces, including the beveled edge, have been reduced, as nearly as possible, to a condition of perfect smoothness, the glass is passed on to the silvering department. Here it must be thoroughly cleansed, and so delicate is this operation that a specially distilled water is often required for the purpose. The glass is now ready for the essential process of silvering. The nitrate of silver is dissolved in water, to which ammonia is then added, and is precipitated by a solution of Rochelle salts or tartaric acid. The glass is placed on warm tables and the solution poured over it. The heat helps the silver to precipitate and adhere to the glass. The silver back receives a coat of shellac and then of paint or of asphaltum varnish containing white lead, which completes the process. Silvered mirrors reflect from 20 to 25 per cent more of light than those backed with quicksilver.

The optical considerations involved in reflection will be found fully discussed together in the article on LIGHT, but brief mention may here be made of mirrors whose reflecting surfaces are other than plane. In a concave spherical mirror we have distant rays of light or heat brought to a focus and a real image formed. Conversely, if a point source of light is placed at the focus of the mirror, a parallel beam of light results. The first idea is made use of in the reflecting telescope (see TELESCOPE), while the

latter is employed in the searchlight (q.v.), recent types of which have been made with a gold reflecting surface.

A *parabolic mirror* is one "in which every section through the principal axis cuts the surface in a parabola, so that rays from a light placed at the focus are all reflected parallel to the axis and, conversely, parallel rays are brought to the focus." The reflector of a locomotive headlight is thus constructed. See ABERRATION, SPHERICAL; LIGHT.

Cylindrical mirrors do not play as important a part in optics and optical instruments as those of spherical and parabolic cross section, but their effects are sometimes interesting. By using a glass that is curved instead of flat the reflected shape of the object will become distorted, a *concave* cylindrical mirror lengthening it at the expense of width and a *convex* mirror producing the opposite effect.

As heat is reflected as well as light from the surface of a mirror, a concave mirror may be used to bring rays of light to a focus. In this way combustible substances may be set on fire at a distance from the reflector whence they receive their heat. The *Archimedean mirror* was made on this plan. A series of mirrors set in a concave curve concentrated the rays of light upon an enemy's ship, causing it, according to the story, to burn.

MIRROR CARP. An artificial variety of carp (q.v.) with very large scales in two or three rows along the sides of its body, which is otherwise bare.

MIRROR FOR MAGISTRATES, A. A long series of poems on incidents in English history showing the tragedies in the lives of great men. The plan was suggested by Boccaccio's *Falls of Illustrious Men* and Lydgate's *Falls of Princes,* and was devised by William Baldwin, George Ferrers, and Sackville, who wrote a general introduction called the "Induction." It was partly printed in 1555, when it was stopped by Lord Chancellor Gardiner. It was licensed, however, in 1559, and then contained 19 metrical biographies, beginning with Tressillian in Richard II's reign. New editions, with additional lives by various writers, appeared in 1563, 1574, 1578, 1587, and 1610, and a reprint of the whole by Haslewood in 1815. Some of the best-known contributors are Michael Drayton, Thomas Churchyard, John Skelton, and Thomas Sackville, whose "Induction" and "Complaint of Stafford, Duke of Buckingham," are the most valuable parts of the work.

MIRROR OF KNIGHTHOOD, THE. A translation of a Spanish romance, *Cavallero del Febo* (The Knight of the Sun), which tells the adventures of Febo and his brother Rosiclair. It belongs in a sense to the Amadis cycle of romance, as the father of the Knight of the Sun was related to Amadis. The Spanish version was evidently the work of several and was left unfinished. The translation of the romance into English was printed in 1578. See Dunlap's *History of Prose Fiction.*

MIRTOV. See LAVROV, P. L.

MIRYACHIT, mêr-yä′chĭt. An Oriental nervous affection, the chief peculiarity of which is mimicry. The patient imitates words and actions said or done by his immediate neighbor. In Java the disease is called lata. The jumpers of Canada and Wales are thought to be afflicted with a similar disease. See JUMPERS.

MIRZA, mēr′zȧ (Pers. *mirzā,* contracted from *Amīr Zādeh,* son of the prince). A Persian title. As a prefix preceding the surname of the individual it is a common Persian title of honor, but when annexed to the surname it designates a prince or a male of the blood royal.

MIRZAPUR, mēr′zȧ-pōōr′. The capital of a district of Benares, in the United Provinces, British India, on the right bank of the Ganges, 30 miles southwest of Benares (Map: India, D 4). It is a well-built city, the river front is lined with a series of fine landing places, and there are many mosques, temples, and residences of rich European merchants. It is noted for its manufactures of carpets and rugs and has large brass and shellac factories. Prior to the opening of the railway to Allahabad it was the largest cotton and grain trading centre on the Ganges and the converging market of north and Central India. Pop., 1901, 66,071; 1911, 32,332.

MIRZA SCHAFFY, mīr′tsȧ shȧf′ē. See BODENSTEDT, FRIEDRICH MARTIN VON.

MISANTHROPE, mē′zän′trōp′, LE. A comedy by Molière (1666) based on a study of character rather than on incidents. It is considered Molière's masterpiece and shows his style at its highest development.

MISCAR′RIAGE. In the broadest sense, a breach of legal duty. This is the signification of the term as employed in the fourth section of the English Statute of Frauds and in similar statutory provisions in the United States, which, in order to make a person liable to answer for the debt, default, or miscarriage of another person, require a special promise in writing.

In medical jurisprudence the term "miscarriage" is sometimes employed as the equivalent of abortion as denoting the premature expulsion of the fœtus before it becomes capable of an independent life. The act of causing miscarriage or abortion in a pregnant woman except for the purpose of preserving her life is a crime at common law and by modern statutes. See ABORTION.

MISCEGENATION, mĭs′ē-je-nā′shŭn (from Lat. *miscere,* to mix + *genus,* race). Mixing of races; usually restricted to amalgamation of Caucasian and African races in America. The expression came into common use in discussions of negro slavery in the United States towards and after the middle of the nineteenth century, when certain publicists advocated the gradual absorption of the blacks by intermarriage with whites. The expression is seldom employed in scientific discussion of racial problems, such collocations as mixing of races, blood blending, etc., taking its place. The process so denoted is of much importance—indeed, one of the primary factors of human development, as is shown by the fact that the most advanced peoples are those whose blood is most mixed. The process of racial assimilation is going on in every part of the world and with progressively increasing rapidity. Even in the United States, despite the most strenuous opposition on both national and sentimental grounds, the admixture of whites and blacks has gone so far that among the 9,000,000 enumerated as colored in the census of 1900, the population of pure-blooded Africans is comparatively small, while the admixture of red and white races has affected a proportion of the population which may be estimated at 30 to 60 per cent of the element reckoned as Indian. The data are too meagre to indicate the vital value of the mestizo type in the United States,

though the experience of Mexico suggests that the value is high. The more general aspects of racial blending are discussed under MIXED RACES. Consult C. B. Davenport, *Heredity of Skin Color in Negro-White Crosses*, Carnegie Institution (Washington, 1913). See CROSS BREEDING IN MAN.

MISCHIANZA, mĭs′kē-än′tsȧ, THE. An elaborate fête or entertainment given at Philadelphia, May 18, 1778, during the Revolutionary War, by officers of the British army, in honor of Sir William Howe, who, having been superseded in the command of the British army in America by Sir Henry Clinton, was about to sail for England. The entertainment, which was given at Walnut Grove, the country seat of Thomas Wharton, lasted 12 hours and comprised a regatta, a mock tournament between the Knights of the Blended Rose and the Knights of the Burning Mountain, a dance, and a dinner. Captain (later Major) André was prominent in planning and directing the entertainment and wrote a detailed description, which may be found in Winthrop Sargent, *Life of Major André* (New York, 1902). Consult also J. F. Watson, *Annals of Philadelphia* (Philadelphia, 1856).

MISCHIEF, MALICIOUS. See MALICIOUS MISCHIEF.

MIS′DEMEAN′OR (from *mis-* + *demeanor*, from *demean*, from OF. *demener, deminer*, to manage, from Lat. *de*, down + *minare*, to lead, drive). The name given by English common law to every crime below the grade of felony (q.v.). By the common law, the offense of greatest enormity is treason, and the least is misdemeanor. The original distinction between felony and misdemeanor consisted in the consequences of a conviction. A party convicted of felony, if capital, forfeited both his real and personal estate; if not capital, his personal estate only. A party convicted of misdemeanor forfeited none of his property. The distinction is not kept up between the two classes of crimes by any greater severity of punishment in felony, for many misdemeanors are punished as severely as some felonies. But it has been the practice of the Legislature, when creating new offenses, to say whether they are to be classed with felony or misdemeanor; and when this is done, the above incidents attach to the conviction accordingly, in the absence of legislation to the contrary.

Misdemeanor, in the United States, does not include, in its legal application, offenses against police regulations, city by-laws, and the like, though in common language and in some statutes it may extend to any misbehavior. It is evident that what is a statute felony in one State may be a misdemeanor in another, and it is therefore impossible to give a complete classification of such offenses. They may be crimes against public justice, peace, health, or trade; against personal or property rights of individuals; or may be mere attempts and solicitations.

In some States it is provided that upon acknowledgment of satisfaction by the injured party, in such cases as assault and battery or malicious mischief, the criminal proceeding shall, with the consent of the magistrate, be dropped —a course which, obviously, would be improper in dealing with felonies. Misdemeanors are usually punishable by fine or by imprisonment for a comparatively short term, as from a month to a year, or by both, and are not rated as infamous crimes. See CRIME; FELONY; CRIMINAL LAW.

MISENO, mē-zā′nō (Lat. *Misenum*), CAPE. A promontory projecting into the Bay of Naples on the northwest and connected with the mainland by a narrow strip of coast, 9 miles southwest of Naples, 3 miles from the ancient Baiæ (Map: Italy, F 1). On the outskirts of the promontory are the scanty ruins of the ancient city of Misenum, including the Piscina Mirabilis, a huge reservoir with a well-preserved vaulted roof, supported by pillars, the Grotto Dragonara, a subterranean vaulted structure, of uncertain use, a theatre, baths, villas, and inscriptions. Misenum was made by Augustus the naval station for a division of the Roman fleet, and for that purpose a great harbor with three basins was constructed, of which the inner is now a lagoon, the Mare Morto. The town was destroyed by the Saracens in 890 A.D. Consult J. Beloch, *Campanien* (2d ed., Breslau, 1890).

MISE′NUM. The ancient name of MISENO.

MISE OF AMIENS, mēz ov ȧ′mē′ăN′ (OF., Fr. *mise*, putting, expense, judgment, from Lat. *mittere*, to send). The name given to the decision of Louis IX of France, delivered as arbitrator between Henry III of England and his barons on Jan. 23, 1264. All points in dispute were decided in favor of Henry, and the Provisions of Oxford (q.v.) were specially annulled. See MONTFORT, SIMON DE; HENRY III.

MISE OF LEWES, lū′ĭs. The name given to the capitulation of Henry III of England after the battle of Lewes, in which on May 14, 1264, the barons defeated and captured him. This treaty greatly limited the royal power, and upon it Simon de Montfort sought to establish a new constitution for England. See MONTFORT, SIMON DE; HENRY III.

MISÉRABLES, mē′zȧ′rȧ′bl′, LES. A noted romance by Victor Hugo, begun in 1846, but interrupted by the author's political activity. It was completed during Hugo's stay in St. Peter's, Guernsey, and was published in 1862, the first part appearing simultaneously in Paris, Brussels, London, New York, Madrid, Berlin, St. Petersburg, and Turin. It formed 10 volumes, divided into five parts, entitled *Fantine, Cosette, Marius, L'Idylle rue Plumet*, and *Jean Valjean*. The interest centres throughout on Jean Valjean, a fallen man who achieves his own rehabilitation after long physical and mental suffering and degradation. The saintly Bishop Mynil or Bienvenu is modeled on De Miolles, Bishop of Digne; Marius represents the author's idea of himself in his youth, and the Baron Pontmercy is intended as a sketch of Hugo's father.

MISERERE, mĭz′ē-rē′rē (Lat., have mercy). The name, taken from its first word, of the Psalm which is the fiftieth in the Vulgate and the fifty-first in the Authorized Version; the principal one of the seven penitential Psalms. It is used on numerous penitential occasions in the Roman Catholic church and forms part of the service for Ash Wednesday in the Anglican Prayer Book. Some of the musical settings of it are famous, especially three which are repeated annually in the Pope's Chapel during the Tenebræ.

MISERERE. A projection on the under side of the seats of the stalls of mediæval churches, chapels, and other ecclesiastical buildings. They are usually ornamented with carved work and are so shaped that when the seats proper are raised they form a support at a higher level to

a person resting upon it. Aged and infirm ecclesiastics were allowed to use these during long services.

MISFEA'SANCE (OF. *mesfaisance*, wrong, from *mesfaire, mesferre*, Fr. *méfaire*, to do wrong, from *mes-*, from Lat. *minus*, less + *faire*, from Lat. *facere*, to do). The doing of a lawful act in an improper or negligent manner; contrasted with malfeasance, the doing of a wrongful act, and with nonfeasance, the failure to perform an act which one is under a duty to perform. When misfeasance results in legal damage to a person, it amounts to an actionable tort, although the same act may be a breach of contract also, as when a common carrier injures a passenger by the negligent use of its property or improper conduct of its servants. See TORT.

MISHAWAKA, mĭsh'ȧ-wą'kȧ. A city in St. Joseph Co., Ind., 4 miles east of South Bend, the county seat, beautifully situated on the St. Joseph River and on the Grand Trunk and the Lake Shore and Michigan Southern railroads (Map: Indiana, E 1). It has good water power from the river and is noted as a manufacturing centre, the products including knit boots, windmills, rubber goods, plows, veneer, ladders, beer, pipe organs, cement blocks, machine-shop products, automobiles and supplies, aluminium castings, iron beds, curtain stretchers, pearl buttons, felt shoes and slippers, cigars, and leather goods. Among the prominent features of the city are the Orphans Home, hospital, public library, high school, and three fine parks. Three concrete bridges span the river at this place. The government is administered under a charter of 1899, which provides for a mayor, chosen every four years, and a unicameral council. The city operates the water works and electric-light plant. One of the oldest cities in northern Indiana, Mishawaka was settled in 1828 and was incorporated in 1834 as "St. Joseph Iron Works," the change to its present name being authorized by a special Act of the Legislature in 1838. Pop., 1900, 5560; 1910, 11,886; 1914 (U. S. est.), 14,579; 1920, 15,195.

MISH'MIS. The natives of the Mishmi Hills in the valley of the Brahmaputra in northeastern India. By language they are related to the adjacent peoples of Indo-China (Chins, Shans, Lushai, etc.). These primitive tribes are very interesting from a sociological point of view. Among them the custom that the favorite child (without respect to age) inherits prevails. They are herdsmen rather than agriculturalists. Consult: Cooper, *The Mishmee Hills* (London, 1873); Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872); Crooke, *Natives of India* (1907).

MISH'NA (Heb., teaching, from *shānah*, to repeat, to teach, to learn). A juridico-political, civil, and religious code of the Jews, embodying what is regarded as the oral Law in distinction from the written Law. As such it forms a kind of complement to the Pentateuchal codes, which it explains, amplifies, and immutably fixes in accordance with traditional usage, enforced by the application of the peculiar exegetical methods developed in the rabbinical schools. The Mishnaic laws were subsequently submitted to a process of exposition similar to that which the biblical enactments underwent, and hence there arose, as a supplement to the Mishna, the Gemara (q.v), embodying the discussions on the Mishna by the rabbis, first of Palestine and then of Babylonia, from the third to the sixth century, when the Mishna and the Gemara had been brought together in the final compilations known as the Palestinian and Babylonian Talmuds. The rabbis whose opinions are given in the Mishna are called Tannaim. They lived at different periods from the Hasmonæan age to the end of the second century A.D. The Mishna, to which again there are apocryphal supplements known as Tosephtas (additions) and Baraithas (extras), which often are of great value, was finally edited, after some earlier incomplete collections, by Rabbi Jehudah, called ha-Nasi (c.200 A.D.) at Tiberias. It is mostly written in late Hebrew, sometimes designated as Neo-Hebraic, and is divided into six portions, or orders (Sedarim): (1) *Zeraim* (seeds), on benedictions, agriculture, tithes, etc.; (2) *Moed* (feast), on the Sabbath, festivals, and fasts; (3) *Nashim* (women), on marriage, divorce, laws on the Nazirship, and vows; (4) *Nezikin* (damages), chiefly civil and penal laws, though containing also the ethical treatise Pirke Aboth; (5) *Kodashim* (sacred things), sacrifices, etc., description of the temple of Jerusalem, and various other subjects; (6) *Teharoth* (purifications), on pure and impure things and persons. (See further TALMUD.) These are subdivided into 63 tracts or treatises. The Hebrew text of the Mishna was first published in Naples in 1492 with the Hebrew commentary of Maimonides, then at Venice in 1549 with the commentary of Obadiah Bartinoro, and often since. The following editions with translation into Latin or modern languages should be mentioned: Surenhusius, *Mischna* (Amsterdam, 1698–1703), containing the Hebrew text of the Mishna, with a Latin translation, and Latin translations of the commentaries of Maimonides and Bartinoro; Jost, *Mischna* (Berlin, 1832–34), containing the text, with a German translation in Hebrew characters, and notes; Sammter, *Mischnajoth* (Berlin, 1886 et seq.), vocalized text with German translation and commentary; Hoffmann and Baneth, *Die Mischna* (Berlin, 1900 et seq.), vocalized text with German translation; Albrecht, Holtzmann, Meinhold, Fiebig, Windfuhr, *Die Mischna, Text, Uebersetzung und ausführliche Erklärung* (Giessen, 1913 et seq.); single treatises by Strack with German translation. A German translation was published by Rabe at Onolzbach (1760–63); an Italian translation by Castiglione is in course of publication (1904 et seq.); and 18 treatises of the Mishna were translated into English by De Sola and Raphall (London, 1843) and under the title "The Talmud" by Barclay (ib., 1878). The treatise Pirke Aboth was translated by Taylor, *Sayings of the Jewish Fathers* (Cambridge, 1877). Consult also the Introductions to the Talmud by M. Mielziner (2d ed., New York, 1903) and H. L. Strack (Leipzig, 1911); Bacher, *Die Agada der Tannaiten* (vol. i, 2d ed., Strassburg, 1903; vol. ii, 1890); *The Mishna on Idolatry*, edited with translation, vocabulary, and notes by W. A. L. Elmslie (Cambridge, 1911); Emil Schuerer, *Verzeichnis der Personennamen in der Mischna* (Leipzig, 1913).

MISILMERI, mē'zêl-mā'rê. A town in the Province of Palermo, Sicily, 10 miles south of Palermo. The castle, situated on a hill overlooking the town, commands a magnificent view of the surrounding country. The inhabitants are chiefly engaged in agriculture, the produc-

tion of oil and wine. Pop. (commune), 1901, 12,819; 1911, 11,876.

MISIONES, mē'sē-ō'nās. A territory of Argentina, situated at the northeast end of the Republic, between Paraguay and Brazil, and bounded on the southwest by the Department of Corrientes (Map: Argentina, H 3). Its area is estimated at 11,285 square miles. It has a subtropical climate and is watered by numerous small affluents of the Paraná and the Uruguay. The soil is very fertile and the varied flora comprises more than 1500 species. Most of the territory is very densely wooded, only a small portion of its area being under cultivation. The chief products and articles of export are cabinet woods, sugar, *yerba maté,* or Paraguay tea, tobacco, corn, rice, cotton, fruits, and hides. In the seventeenth century the Jesuits planted in and around the present territory over 30 missions. With the expulsion of the Jesuits their missions fell into decay. The population of the territory in 1900 was 32,521; in 1912 (est.), 45,174. The capital of the territory is the thriving town of Posadas on the Paraná, with a population of about 15,000.

MISKO'A. A remarkable order of the Chætopoda, discovered by Walcott in the Middle Cambrian rocks of British Columbia, where the fossils are preserved with all details of structure. They are Polychæta, having similar segments and parapodia throughout the length of the body, with a retractile proboscis and straight enteric canal. Their primitive structure is shown in that their body is not distinctly specialized into sections. Striking types of the order include Miskoia and Wiwaxia (qq.v.). They are named after Misko Pass in British Columbia.

MISKOLCZ, mĭsh'kôlts. The capital of the County of Borsod, Hungary, situated in the valley of the Szinva, 88 miles northeast of Budapest (Map: Hungary, G 2). It has several interesting ecclesiastical buildings, among them the thirteenth-century Reformed church of St. Stephen, a Minorite convent, a merchants' hall, a Protestant Gymnasium and two lower Gymnasia, a fine hospital, and a Hungarian theatre. It is lighted by electricity and has a fine municipal bath. The trade in wine, agricultural products, and cattle is considerable. The local manufactures consist of flour, shoes, pottery, porcelain and majolica wares, and machinery. There are large wine cellars in the neighborhood. Pop., 1900, 43,096; 1910, 51,459, chiefly Protestant Magyars.

MISNO'MER (OF. *mesnomer, mesnommer,* dialectic Fr. *ménomer,* misname, from *mes-,* from Lat. *minus,* less + *nomer,* name, from Lat. *nominare,* to name, from *nomen,* name). An error in naming a person in a pleading, deed, or other written instrument. Under the common-law rules of pleading a party intended as the defendant in an action can take advantage of a mistake in designating him by an incorrect name by a plea in abatement which simply alleges the error and states his true name. However, in England and the common-law jurisdictions in the United States this defect may now be cured by amendment if the person so served appears in the action, even though he pleads the misnomer. Where a person is served with a process intended for him but not designating him by his correct name, he may disregard it, and a valid judgment cannot be entered against him. Under modern codes of procedure the same rules apply, except that if a person is served with a summons incorrectly naming him, and he desires to appear and object, he must make a motion to set aside the service on the ground of mistake. In such a case the plaintiff will be allowed to amend his summons and complaint, usually upon terms, such as the payment of costs. The term "misnomer" is less frequently but correctly applied to a mistake in a name in written instruments other than pleadings. See INTERPRETATION; EQUITY; MISTAKE; NAME; PLEADING; WILL; ETC.

MISPICK'EL (Ger.). See ARSENOPYRITE.

MISPRISION, mĭs-prĭzh'ŭn (OF. *mesprision, misprison,* mistake, from *mesprendre,* to mistake, from *mes-,* from Lat. *minus,* less + *prendre,* from Lat. *prendere, prehendere,* to take). In its general sense, a crime under the degree of a capital offense but graver than an ordinary misdemeanor (q.v.). In the early English law it was more frequently employed in a negative or passive sense, to describe the omission to perform some important legal duty, as concealment of the felonious acts of another. It is also applied to certain positive acts in the nature of contempts against the dignity and peace of the King and his officers. Misprision of treason was the most serious offense to which the term applied, and consisted in the concealment of any knowledge which a person might have of treasonable acts or utterances against the King, and did not necessarily imply that the person was himself otherwise implicated or involved in the crime. It was formerly punishable with forfeiture of goods and imprisonment for life, but by statute forfeiture of goods has been abolished, and penal servitude for life remains the maximum statutory penalty. Misprision of felony is concealment of a felony by one who did not participate in its commission by act or encouragement, but who has learned of it in some way. It is still an offense in the English law, but is rarely prosecuted. The various acts and omissions, other than the above, which were formerly included in the rather vague term "misprision," have been mostly classified with the crimes with which they were associated, under the name of accessory acts.

The term "misprision" is seldom employed in the United States except in regard to treason, and by an act of Congress misprision of treason is punishable by a fine not exceeding $1000 and imprisonment not exceeding seven years. See ACCESSORY; CRIME.

MISREP'RESENTA'TION. An untrue representation, by words or by conduct, which induces another to act to his injury. When deliberately or recklessly made by one party to a business transaction concerning a matter of fact and relied on by the other party to his damage, it amounts to fraud (q.v.), or deceit (q.v.). A false representation, if made by an honest mistake, never subjects the maker to an action in tort. Whether it will afford the party to whom it is made a ground for relief of any kind depends upon the circumstances of the case. As a rule, an innocent misrepresentation will not affect the validity of a contract in connection with which it is made, unless it was the very basis of the contract or one of its material terms.

In certain classes of contracts, notably those of marine and fire insurance (q.v.), any misrepresentation or concealment of a material fact, however innocent, renders them void. This is

due largely to the fact that such contracts have come into English law from the law merchant, and that early mercantile usage put an absolute legal duty on the insurer to state correctly all facts relating to the thing insured, which would ordinarily affect the insurer's decision in taking the risk. Courts of equity deal somewhat differently with innocent misrepresentation from courts of common law. They will generally refuse a decree for specific performance in favor of one whose claim rests upon a misrepresentation, although it is an honest one; and in some cases they grant a rescission of a contract induced by such statements when in a court of law the contract would be enforceable. Consult: Anson, *Principles of the Law of Contract* (Oxford, 1900); Burdick, *The Essentials of Business Law* (New York, 1902); Kerr, *A Treatise on the Law of Fraud and Mistake* (London, 1902).

MISRULE, Lord of. A mock dignitary who presided over the Christmas revels of the Middle Ages. He was assisted by a staff of from 20 to 60 officials, and furnished with musicians, dragons, hobbyhorses, and other paraphernalia of fun. In Scotland the Lord of Misrule was sometimes known as the Abbot of Unreason, and in France as l'Abbé de Liesse. See Abbot of Joy.

MIS'SAL (ML. *missale*, from *missalis*, relating to the mass, from *missa*, mass). The book which contains the prayers, lessons, and rubrics of the mass in the Roman Catholic church. Until the Middle Ages the various parts of the service were distributed in separate books, according to the part taken by the assistants; the parts which the celebrant alone recited in the mass and other sacraments were contained in the *Liber Sacramentorum*, or sacramentary. But when low masses became more frequent, and the celebrant had to say practically the whole service, the parts were collected into one book called *Missale Plenarium*. These complete missals have been in use since the sixth century. By the twelfth the Roman liturgy was in use generally throughout western Europe, but a number of provinces and dioceses had their own missals. The disadvantages of this diversity in liturgical use caused numerous requests to be made to the Council of Trent for a reform in the matter. The Council appointed a commission on the subject in 1562, and as they had not concluded their labors by the last session, left the decision in the hands of the Pope. The commissioners, among whom was Thomas Goldwell, Bishop of St. Asaph in Wales, were not instructed to compile a new missal, but by examination of ancient manuscripts to reconstruct the Roman missal according to the rites and customs of the fathers. Pius V authorized the missal which was the result of their work by the bull *Quo Primum* of 1570, commanding its universal use in places which could not show a prescription of 200 years for their local uses. Thus the older orders, such as the Carthusians and Dominicans, preserved their traditional rites; and the Ambrosian missal held its ground in the diocese of Milan. Further revisions took place under Clement VIII in 1604 and Urban VIII in 1634; later revisions, as by Leo XIII in 1884 and 1898, have touched merely matters of detail, principally in the rubrics. Besides these and the tables which are in the beginning of the book, it includes the proper of the seasons, i.e., the service for the Sundays and greater festivals; the proper of saints, arranged in the order of the civil calendar from St. Andrew's Day, which regulates the beginning of Advent and thus of the ecclesiastical year; and the common of saints, the services for those days which have no special mass. The central and invariable parts, known as the *Ordo* and *Canon Missæ*, come before the service for Easter Day. The older local missals, especially the French and English, are of great interest to liturgical students. No new attempts have been made to construct such books in the Catholic church except by some French bishops under Jansenist influence about the end of the seventeenth century; these held their own in certain places even as late as the middle of the nineteenth century, when they were all laid aside, largely through the influence of the celebrated scholar Dom Guéranger. Consult William Maskell, *The Ancient Liturgy of the Church of England, according to the Use of Sarum, York, Hereford, and Bangor* (3d ed., Oxford, 1882). See also Liturgy, and references given there; Mass.

MISSEL THRUSH. See Mistle Thrush.

MIS'SI (Lat., those sent). Officials sent out by the Frankish kings for special purposes. Under Charles the Great the *missi dominici* were the Emperor's special representatives. The Empire was divided into a number of districts; into each district each year two *missi*, one a lay noble, the other an officer of the Church, were sent to hold court, hear complaints, redress grievances, and make a special report to the Emperor. By this means Charles sought to control the courts and to centralize the government. The *enquêteurs*, employed by St. Louis, had similar functions. Consult Dobbert, *Ueber das Wesen und den Geschäftskreis der Missi Dominici* (Heidelberg, 1861), and J. W. Thompson, *Decline of the Missi Dominici in Frankish Gaul* (Chicago, 1903).

MISSING LINK. A term used to designate the stage assumed to intervene in evolution between the ape and man, and in a more general sense any hypothetical form intermediate between two actual forms of life.

MISSION (Lat. *missio*, a sending, from *mittere*, to send). In the singular, a term used by Roman Catholics and Anglicans to designate a series of special services lasting usually for at least a week, intended to call sinners to repentance and to deepen the spiritual life of the faithful; somewhat analogous to the revival services in some other churches. In the Roman Catholic church such work was constantly carried on by some of the most famous saints, such as Francis of Assisi, Dominic, Carlo Borromeo, Francis de Sales, Vincent de Paul, and Alfonso Liguori. The last two especially founded their congregations (see Lazarists; Redemptorists) for such a purpose. In modern times the means employed and the order of exercises have become more systematic. Fervent preaching by the missioners, who are usually members of some religious order, is the salient feature; it deals largely with sin, repentance, death, judgment, heaven and hell, and its purpose is to bring the hearers to a devout reception of the sacraments and an earnest Christian life. It usually closes with a solemn service of renewal of baptismal vows, thanksgiving, and consecration, and with the proclamation of a special indulgence. In the last third of the nineteenth century similar missions were held with increasing frequency in the Anglican communion, especially in High Church parishes.

MISSION, Congregation of the. See Lazarists.

MISSIONARY RIDGE, Battle of. See Chattanooga, Battle of.

MISSION INDIANS. A collective term for the surviving remnants of the tribes civilized and Christianized by the efforts of the Spanish Franciscan missionaries in southern California in the latter part of the eighteenth century. They were originally of many various dialects and stocks, chiefly Shoshonean and Yuman, roving over the desert and mountain region stretching from the lower Colorado River to the Pacific, and in almost the lowest stage of culture. By the heroic and persistent labor of Father Junípero Serra and his successors, beginning in 1776, they were gathered into civilized communities, where they supported themselves by farming and simple mechanical arts and, under the kindly supervision of the fathers, reared those magnificent mission structures which are the glory of old California. For half a century the missions grew and flourished, until in 1831 they contained 19,000 civilized Indians, but with the overthrow of the Spanish power by the Mexican revolutionary government came oppression, spoliation, and finally confiscation and destruction in the period from 1835 to 1840. The missionaries were banished, the missions plundered and left to fall into ruin, and the Indians driven into the desert and the mountains. Under the later American rule the remnants of the mission Indians continued to be regarded and treated as outcasts until, chiefly by the endeavor of Helen Hunt Jackson (q.v.), public attention was so forcibly directed to their neglected and unfortunate condition that the government took steps for their relief by setting aside some small reservations for their occupancy and appointing an agent to look after their affairs, together with a good school equipment. Since then some progress has been made towards bringing them up to the standard to which they had attained under the mission system more than a century ago. The two great barriers in the way are the uncertain tenure of their lands and the monopoly of the water supply by white claimants. At present they occupy a number of small reservations in southern California. The total population is about 2000. They are best known as the makers of fine baskets. Consult: Jackson and Kinney, *Report on the Condition and Needs of the Mission Indians of California* (Washington, 1883); C. A. Wetmore, *Report on Mission Indians of Southern California* (ib., 1895); Zephyrin Engelhardt, *Missions and Missionaries of California*, vol. i (San Francisco, 1908); "A Mission Record of California Indians," in *University of California, Publications: American Archæology and Ethnology*, vol. viii (Berkeley, 1908).

MISSIONS, Christian. The term "missions" as used in this article signifies Christian missions among the peoples of non-Christian countries. The history of missions may be divided into three periods: 1. The early period, embracing the first seven centuries of our era, until the rise of Islam. In this period missionary activity was generally unorganized and individual. 2. The middle period, including nine centuries, from the beginning of the eighth to the end of the sixteenth century. Here the Church as an organization originated and directed foreign-missionary activity. 3. The modern period, from the beginning of the seventeenth century until the present time. In this period occurred the rise of Protestant foreign missions, chiefly conducted by voluntary societies.

I. THE EARLY PERIOD

The energy of the Apostles in winning men to believe in Jesus Christ is a characteristic feature of the New Testament narrative of the beginnings of Christian history. Early traditions give ground for belief that their missionary operations were extended. Yet excepting in the case of Paul and his companions details are meagre. The explanation of the rapid spread of Christianity seems to be that individual believers taught it wherever they went, whether for business, for safety from enemies, or as slaves to heathen masters. Great importance was attached also to translating the Bible into the language of every people at this period. Examples of this automatic spread of Christianity may be seen in its appearance in Antioch before any Apostle went there, its entrance into Italy before Paul's visits, into Britain by way of Gaul from Smyrna during the second century, along the ordinary routes of trade, and into the bivouacs of the Goths in the third century through captives taken in war. By the time of Constantine the Great, early in the fourth century, groups of Christians were found in all parts of the Roman Empire, from Britain to Persia. Christians formed but a small percentage of the population. But they had a high ideal and the energy of aspiration. This produced unflagging activity in missions in the West and in the East. The monasteries now performed great services for religious culture in out-of-the-way places. In the fifth century the centre of missionary initiative for the West seems to have been in central Gaul. Thence bishops went over into Britain to help the Christians settle doctrinal difficulties, and thence Patrick took his new-found knowledge into Ireland. For the East at the same time the centre of missions seems to have been in Mesopotamia, at places like Edessa and Nisibis, with a long chain of advance posts reaching into central Asia and India, and with a training school at Samarkand. Towards the north at the same period Ulfilas (q.v.) went on a mission to his heathen kin in the region of the Danube, giving them an alphabet and a Bible in their own tongue. In the sixth century the initiative in the West was from the British Islands eastward and from France northward. Desire to teach Christ brought Columba from Ireland to Iona, which became a wonderful centre of Christian culture and of missionary zeal in behalf of Scotland, North Britain, and central Europe. As to the East, the line of foreign missionary advance was among the Tatars and in China, and was carried on by Nestorians in relations with the Church in Mesopotamia. At the very end of the sixth century the beginning of a missionary policy in the Church as an organization appeared in the dispatch of Augustine (q.v.) and his helpers from Rome to England, where the Saxon invasion had nearly crushed out Christianity. Augustine's mission from the Pope was to evangelize the pagans and to win the assent of the English Christians to Roman ecclesiastical control. The method of operation of these independent missions was an adaptation of the monastic system. A band of Christians under a leader would form a settlement in a wild and savage

region, where they labored for their own support. By kindness some of the barbarians would be drawn to settle near the monastery. After the favor of emperors began to give the Church numerical preponderance, power, and wealth, these gains led to spiritual loss, and missions were left to the chance ability of simple-minded believers in remote regions. At the beginning of the seventh century Christianity was still an Oriental religion. In Europe its northern bounds were, in general, marked by the Danube and the Alps, although during the century missionaries made ineffectual attempts at a lodgment in Denmark, and Columban, going forth from Iona with his associates, began a fiery and successful propaganda among the barbarians of central Europe. The narrow limits of European Christendom at this time should be borne in mind if we would realize the full meaning to the Christian Church of the Mohammedan irruption. The Eastern church had one momentous mission to its credit in the ninth century in its dispatch of Cyril and Methodius to work among the Slav races. In the Far East the Nestorians also continued their operations until the Tatars finally cast in their lot with Islam, and Tamerlane in the fourteenth century destroyed the last vestiges of the Central Asian church. But with regard to the Church in general, from the end of the seventh century onward for 900 years the only Christian foreign missions were remote from the touch of the Mohammedan power and belonged to the Western or Latin section of the church.

II. THE MIDDLE PERIOD

1. In Germany. The wanderings of the Germanic nations and the inroads of the Huns had destroyed along the Rhine and the Danube the flourishing Christian communities of the fifth century. It was only after the rise of the Frankish state that efforts were made to restore the former condition of Christianity and to spread its influence over all central and northern Europe. From the conversion of the Bavarians to that of the Saxons (500–800) stretches a period filled with spiritual heroism on the one side and with tenacious resistance on the other. The missionaries are mostly Irishmen in the first half of the period, Anglo-Saxons in the other. The memory of the famous St. Severin (died 482) worked favorably in Bavaria; early in the sixth century the royal family of the Agilulfings was Catholic. Irish missionaries worked in the land throughout the seventh and eighth centuries. The Frankfort saints Rutpert, Emmeran, and Corbinian continued and perfected their labors. The Irishman St. Gall (Callech) was the apostle of Swabia and Helvetia; from his monastery by Lake Constance went out the missionaries of these lands. At the same time his superior and long-time companion, Columban (died 615), converted the German Lombards of Italy to the Catholic faith. Southern Germany owes the knowledge of the Christian faith to other Irish missionaries—St. Fridolin, once abbot at Poitiers and then founder of the island abbey of Säckingen; St. Trindpert, founder of the abbey of that name in the Breisgau; St. Pirmin (died 753), founder of Reichenau, Murbach, and Hornbach. The Irishman St. Kilian (died 689), with his companions Coloman and Totnan, evangelized Thuringia, and founded the see of Würzburg. Contemporaneously St. Willibrord came from the monastic schools of Ireland to preach the faith to the fierce Frisians and to found the archbishopric of Utrecht, with the authorization of Pope Sergius I (695). Before Willibrord there had worked along the Rhine and the Moselle the holy man Goar in the sixth century, and among the Frisians St. Amand of Maestricht (660) and the goldsmith St. Eloi (Eligius) of Noyon (659). All of these men came under the influence of the Columban monastery of Luxeuil and were filled with missionary zeal.

The real apostle and founder of German Christendom is the Anglo-Saxon Wynfrith, or Boniface (q.v.). In 716 he attempted to evangelize the Frisians. In 719 he received at Rome from Gregory II (715–731) the authority to preach among the degenerate Christians and the pagan inhabitants of Germany. In turn he labored throughout Bavaria, Hesse, and Thuringia, and along the Rhine, founded the oldest and principal sees of those regions, established monasteries like Fulda, and gathered about himself some of the noblest spirits of the age. The Carolingians were always friendly and helpful. In union with them he held, between 740 and 750, four national synods that laid the basis of German mediæval Christian life. He suffered martyrdom June 5, 755 (?754), at the hands of heathen Germans, near Dockum in West Friesland, whither he had gone with 52 companions to confirm some newly baptized converts. The solid mass of Saxon paganism had been attacked by the two Ewalds, surnamed the Black and the White, like Willibrord, disciples of the Irish monastic schools. They sealed their hopes with their blood in 695. The long wars of the Carolingians with the Saxons soon took on a religious character. Compulsory baptism and swift apostasy were the rule throughout the eighth century. A cruel slaughter of 4500 Saxons at Verden in 782 stains the fair fame of Charlemagne. The conquered Saxons were exiled, transplanted, oppressed by laws of Draconian severity; in 785 the dauntless chiefs, Witikind and Alboin, finally yielded, and by 804 the land was entirely Christianized. Missionaries soon overran Saxony, and by their virtue, beneficence, organizing skill, and their monasteries, soon established the Christian faith on a firm basis. The abbey of Corvei (822) was soon the centre of their activity.

2. Among the Northern Nations. Another period of 300 years (800–1100) was necessary for the winning of the northernmost Germanic tribes. In 826 political necessity made Harald, King of Denmark, a suitor at the court of the Carolingians. On his return he took with him Ansgar, a monk of Corvei, eventually the apostle of the North. His chief deeds were the establishment of the see of Hamburg-Bremen (832), the partial evangelization of Sweden (850), the building of churches, schools, monasteries, and hospitals throughout his own vast diocese. He died in 865 and is buried at Bremen. The devastations of the pagan Northmen and the onslaught of the Hungarians withheld from the northern missions the political influence of Christian Germany; after the battle of Merseburg (933) the conversion of Denmark went on, not without interruption, from the see of St. Ansgar. The Danish conquests in England helped this process; in 1017 both kingdoms were ruled by Canute the Great; in 1026 he was a pilgrim to Rome, whence he wrote to his people a noble Christian letter. In 1086

another Canute was enrolled among the Christian saints. In 1104 Lund was made a metropolitan see. Sweden was slowly won over to the faith of Jesus Christ, chiefly in the course of the eleventh century, and with many a reaction to pagan life and belief. In 1162 Upsala became the Christian metropolis of Sweden. Long ere this Norway possessed a metropolitan see at Trondhjem (1035). The land was thoroughly Christian before Denmark and Sweden, although it received the visits of missionaries after both of these kingdoms. Haakon the Good (c.934–960) was an earnest Christian King, but another did not arise until Olaf Tryggvason (995–1000). Olaf Haraldson (1016–28) sent German and English priests through the Kingdom; his overstern and cruel policy created a reaction, but the still harder yoke of Denmark favored the cause of Christianity. From 1035 Norway may be styled a Christian kingdom. Iceland was temporarily inhabited by Irish monks before the year 800; their books, altar plates, and staves were found by the first Norwegian settlers. After 981 Christianity penetrated the masses of the colonists and by 1016 they had accepted the Gospel. Under its impulse this gifted little people became a living source of learning and piety. The scattered islands of the northern seas were held during the ninth century in the grip of the pagan vikings, but in the course of the tenth century were made Christian. Before the epoch of the Danish invasions of Ireland monks of the Irish nation had visited these islands, chiefly out of ascetic fervor and the desire to lead hermit lives. They were the first to bring Christianity to the dwellers of the Orkneys, the Hebrides, and the Shetland and Faroe islands. In the twelfth century Greenland was evangelized and the see of Gardor established on the coast; the land was inhabited by Christians until the fifteenth century.

3. **Conversion of Eastern Europe. Slavs and Magyars.** As the Slavs had been, since the sixth century, a serious menace to both the East and the West, so the efforts to Christianize them went out from East and West. The Irishman St. Columban, of Luxeuil and Bobbio, had once hoped to begin the work; it was certainly set on foot from the German see of Salzburg in Bavaria, and a beginning made (797) with the Avars, who at this time disappear from history. In the course of the ninth century the principal Slavic principality was that centred along the river Morava, hence called Moravia. Both Germans and Byzantines sought to reserve this sphere of influence and action for themselves. In 862 the Byzantine Emperor, Michael III, was able to send two missionaries to the Moravians. They were brothers, known to history as St. Cyril (originally Constantine) and St. Methodius. They introduced among the Slavs an alphabet, translated the Scriptures, and wrote for them a Slavic liturgy. To these two men the Slavic world owes its first permanent elevation from idolatry, ignorance, and serious moral corruption. Moravia's chief see, Olmütz, dates from 1063.

Bohemia was fully opened to Christian influences only about 871, when its King, Borzivoi, gave his daughter in marriage to Svatopluk of Moravia and, together with his Queen, Ludmilla, was baptized. Of his grandsons, Boleslas cruelly persecuted the Christian faith, while Wenceslas remained faithful; the latter fell by the hand of his brother (938), and is honored as a martyr. In the long reign of the second Boleslas (967–999) Christianity triumphed. The see of Prague was created in 973. The second Bishop, St. Adalbert, went to preach the gospel among the heathen Prussians, and was put to death by them.

Poland received the missionaries of Christianity through the marriage (965) of its Duke Miecislas with the Christian daughter of Boleslas II of Bohemia, who soon won over her husband to the faith. The see of Posen was established in 968. From 992 to 1025 Boleslas Chrobry, son of Miecislas, completed the conversion of his country by the founding of the archiepiscopal see of Gnesen (1000), to which were made subject Posen, Kolberg, Breslau, and Cracow.

The Wends were a Slavic race, established in Holstein, Mecklenburg, between the Elbe and the Oder, the Oder and the Vistula, and elsewhere in Saxony and Lusatia. They were made Christians by the creation of the border marches in the time of Henry I and Otho I (919–973) and the foundation of the sees of Havelberg, Oldenburg, Brandenburg, Magdeburg, and others (946–968). The Wend Prince, Gottschalk, was after 1045 a zealous protector of Christianity, but was treacherously slain in 1066 by a heathen Wend. In the twelfth century the Wends fell under German sway and many German Christian colonists took their lands and houses. The Wends of Pomerania owe their conversion to the Polish Duke Boleslas III (1122) and to his agent, Bishop Otho of Bamberg (1124–28). Kamin, Stettin, Julin, were made Christian cities and Saxon colonists entered the territory; but only in 1168 were the last remnants of heathenism abolished on the island of Rügen.

The Scandinavian Rurik founded the Russian state in 862; soon Christian missionaries from Constantinople found their way thither. The widowed Princess Olga was baptized at Constantinople in 955 and thenceforward labored zealously for the conversion of her people. Her grandson, Vladimir the Apostolic (died 1015), completed the work. The metropolitan see of Kiev was established by him and made the centre of the religious and educational life of Russia. The primacy was transferred to Moscow in 1328, which in turn was subject to the jurisdiction of Constantinople until 1589, when Jeremias II, the patriarch of the latter see, was induced to install the patriarchate of Moscow.

Bulgaria became Christian, 864–866. The Khan, Bogoris, first introduced Greek missionaries and then appealed to Pope Nicholas I. The latter sent him the famous "Replies to the Consultations of the Bulgarians." Nevertheless, Bulgaria soon came under the sole jurisdiction of Constantinople; the land was subjected by the Byzantine emperors, and in 1388–93 the new Bulgarian realm was conquered by the Turks.

The heathen Magyars had taken possession after the end of the ninth century of what is now Hungary. All attempts at their conversion were fruitless until the victory of Otho the Great of Germany on the Lech in 955. Duke Gejza (972–997), married to a Christian Princess of his own race, asked Otho II for missionaries; the bishops Pilgrim of Passau and Wolfgang of Regensburg were sent to him. Gejza's

son, St. Stephen of Hungary (997–1038), was married to Gisela, the daughter of Henry II. He created the hierarchical system of Hungary by founding (1000) the archiepiscopal see of Gran with 10 suffragan sees, as well as many Benedictine monasteries. Pope Sylvester II (Gerbert) gave him the title of "Apostolic" King, and is said to have sent him a golden cross and crown (crown of St. Stephen).

4. **Missions in Northeastern Europe. Political Conversions.** The power of Christendom was now too great to be longer resisted by the outlying heathen peoples. From Sweden went out at the same time the political subjection of Finland and its conversion to Christianity. It was only in 1293 that the work could be looked on as accomplished. Esthonia, Livonia, and Courland saw Christian missionaries during the twelfth and thirteenth centuries follow in the tracks of the German merchants of Bremen and Lübeck. Here the heathen were fierce and reluctant; fortified monasteries protected the German Christians and the newly converted, until, in 1202, was founded the military order of the Brothers of the Sword (*Schwertbrüder*) or Knights Sword Bearers. Its founder, Bishop Albert of Buxhöwden, built the city of Riga and set up therein his see. In 1237 the Brothers of the Sword were united with the Teutonic Knights of Jerusalem, and for 60 years both orders carried on an unceasing warfare against the pagan inhabitants of the Baltic shore. Their most difficult conquest was that of the Prussians. This most stubborn of the northern heathen folk gave way only before the organized and experienced knights of German Christendom and the moral and financial support of the Empire. In 1243 the Prussian territory was divided into four sees—Kulm, Pomerania, Ermland, Samland; in 1255 they were placed under the jurisdiction of the archiepiscopal see of Riga. The Lithuanians, temporarily converted in 1252, relapsed into heathenism. Their Grand Prince, Jagello, married in 1386 the Polish Queen Hedwig, by which act Poland and Lithuania were shortly made one politically. Jagello was baptized, assuming the title of Ladislas II. Vilna was made an episcopal see, and at a diet held there Christianity was declared the state religion.

5. **Missions in the Sixteenth Century.** (*a*) *In the Orient.*—The Portuguese sailors and the merchants were always accompanied by missionaries. As early as 1533 Goa was made an episcopal see. The unworthy conduct of the Europeans was no small obstacle for the missionaries when confronted with such religious systems as those of the Brahmans, Buddhists, and Mohammedans. At the request of the King of Portugal St. Ignatius of Loyola destined for the East Indies in 1540 Rodriguez and St. Francis Xavier. The latter actually sailed in 1541 from Lisbon, and after some time spent in evangelizing the Europeans of Goa, turned his attention to the people of southern India. He preached in the Kingdom of Travancore, and went thence to Malacca and the Moluccas, meeting everywhere with great success. Soon his zeal urged him to undertake the conversion of Japan, where he spent two years (1549–51). In the hope of hastening the conversion of Japan, he turned his attention next to China, but died on the way on the island of Sancian, in November or December, 1552. His labors in the East Indies were continued by his Jesuit brethren, especially by Robert Nobili, after 1606. The latter made himself one with the Indian aristocracy, accepted its prejudices, habits, and customs, so far as seemed consistent with Christianity, and enjoyed a large measure of success.

The Nestorian missions in China during the seventh and eighth centuries and the Franciscan missions of the thirteenth and fourteenth had no lasting results. In 1583 the Jesuits obtained entrance, and for over a century exercised a moral supremacy in the Flowery Kingdom. Matteo Ricci (1552–1610) rose to the highest official position. His teaching, surveys, and maps were the admiration of all China.

Adam Schall of Cologne (1622) and Ferdinand Verbiest of the Low Countries (1659) won great fame for their order as successors of Ricci. Under cover of their reputation for scholarship they labored zealously for the spread of Christianity, quite in the spirit and manner of Robert Nobili. The opposition to this system of "accommodation" grew so strong that it was condemned in 1704, and the condemnation was confirmed 40 years later (1744) by the holy see. The Christian communities of Japan were grievously persecuted in 1587 and again from 1596 to 1637, when the Empire was strictly closed against all foreigners, with the exception of Dutch traders.

(*b*) *In America.*—The original Spanish conquistadores were very inhuman towards all nations with whom they came in contact. The first Catholic priest ordained in the New World was a young Spanish lawyer, Bartolomeo de las Casas. He soon gave himself entirely to the work of saving the Indians from their barbarous oppressors; and before his death, in 1566, he had compelled the legislation which saved the remnants of the aboriginal tribes, at least on the mainland. Similarly, St. Peter Claver (died 1654) was tireless in the service of the unfortunate negro slaves of South America. Throughout the sixteenth century Dominicans, Franciscans, Capuchins, and Augustinians labored with boundless zeal in all the Spanish colonies. The Jesuits were already in Brazil (1549), and soon had their missionaries in all parts of South America. The famous "Reductions of Paraguay" are perhaps their greatest triumph. One of the most picturesque figures of that period is the Limerick Irishman, Thomas Filde, a Jesuit, who died at Asunción in 1626, after spending 40 years among the savages of Paraguay. In North America the French missionaries followed the flag of France and worked unremittingly after 1611 throughout all the dominions over which it floated. In 1634 Jesuit missionaries accompanied the first colonists of Maryland.

III. THE MODERN PERIOD

A. **Protestant Foreign Missions.** 1. *State Missionary Enterprises.*—At the time of the Reformation Christendom was still beleaguered by armed Islam. Up to the very end of the seventeenth century a great part of Hungary was in the possession of Turkey, and in 1683 Vienna barely escaped falling into the hands of the Mussulmans. Missionary access to eastern north Africa and western Asia was barred by the sword of Islam. At the same time transmarine heathen lands were so distant that Imperial resources alone could reach them. Such resources were all in the hands of the great Roman Catholic powers. The conditions under

which the Reformation developed left to the reformers no place for planning foreign-missionary enterprise. Luther and his associates appreciated the essentially missionary quality of the Church of Christ, but limited its sphere of action to their own surroundings. They deemed that in any case the Church was helpless regarding foreign missions, since such vast undertakings could be dealt with by governments alone.

The first Protestant foreign missions, then, were state enterprises. In 1555 Admiral Coligny induced the Council of Geneva to send missionaries to Brazil in connection with a Huguenot colony, but both mission and colony soon ended in bloody disaster. In 1559 Gustavus Vasa of Sweden sent missionaries to labor for the pagan Lapps of his own dominions, but this mission came to naught. After the conquest by Holland of several Portuguese colonies in the East Indies the Dutch East India Company was formed in 1602, and the governors of the various islands were ordered to do all in their power to Christianize the natives. Clergymen were sent out to Ceylon, Formosa, and the Malay Archipelago as missionary chaplains, whose duty included the Christian instruction of natives. But the governors of the colonies obeyed their orders literally and "Christianized" the natives without waiting for the missionaries to instruct them. Consequently, when Dutch government came to an end in Ceylon, some 300,000 officially converted natives returned to their former faith. In Formosa Christianity was extinguished by the Chinese when they drove the Dutch from the island in 1661. In Java, however, the missionary chaplains slowly translated the Scriptures into Malayan. The second of modern Bible translations into pagan languages (John Eliot's Indian Bible, printed in 1683, being the first) was thus produced by the initiative and published (in 1701) at the expense of the Dutch government. With all its defects this state mission enterprise had permanent results. In Java, the Moluccas, and Celebes has grown up a native Christian church, numbering nearly 250,000 adherents, with over 350 pastors and preachers, supported by the Dutch government. Of these probably not more than half are the fruit of later missionary efforts. A similar mission undertaken by Holland in Brazil, through the West India Company, about the year 1621, came to an end with the expulsion of the Dutch about the middle of the century. Such missionary enterprises undertaken for reasons of state, manned by official appointment, and supervised by colonial bureaus and chambers of commerce, were foredoomed to failure. The next of the state missionary enterprises originating on the continent of Europe illustrates this fact. In 1705 a woman whose husband had been killed by natives in the Danish colony of Tranquebar, in South India, petitioned King Frederick IV of Denmark to send missionaries to teach the people there. The petition was effective. The King endowed the mission, and, no fit men being found in Denmark, two Germans were appointed to go to India. They were of the disciples of Francke, the German pietist, who saw that the highest form of Christian fruitfulness includes foreign as well as home missions, and whose energy formed schools at Halle to prepare men to serve Christ in the ends of the earth. The two young men, Ziegenbalg and Plutschau, taught singleness of purpose at Halle, and sent out by King Frederick IV in 1706, began the first serious Protestant mission enterprise in India. Before his death, in 1719, Ziegenbalg had made a translation of the New Testament into the Tamil language, which became the basis of the existing Tamil Bible, and the third modern translation of the Scriptures into heathen languages. Other missionaries from the same home surroundings followed the two pioneers of this Danish mission, notably Schultze and his later associate, Schwartz. Each of these men made a permanent impression upon the people of the country. Fifty thousand Tamils became Christians before the end of the century. After the death of King Frederick IV the English Society for the Promotion of Christian Knowledge assumed the whole support of the Danish mission in India until 1824, when the enterprise was passed over to the Society for the Propagation of the Gospel. Another mission maintained by King Frederick IV was that commenced by Hans Egede in Greenland in 1721. It was later transferred to the Danish Missionary Society, and the whole Eskimo population in the neighborhood of the numerous Danish trading stations was long ago Christianized.

The British government took steps early in the seventeenth century for the Christianizing of its colonies. The Virginia Company, whose enterprise began in 1584, was directed by its charter to teach Christianity to the Indians, and Sir Walter Raleigh subscribed £100 to that object. The same duty was laid upon the Massachusetts Colony by charter in 1628. In 1646 the Legislature of Massachusetts passed a law for missionary work among the Indians. This gave State support to the efforts of John Eliot of Roxbury, Thomas Mayhew of Marthas Vineyard, and others. In 1648 Cromwell induced the English Parliament to consider the organization of a government foreign-missionary enterprise. The renewal of civil war, however, put an end to the scheme. But the Corporation for the Propagation of the Gospel in New England, formed in England in 1649, received a grant from Parliament and aided Eliot's mission. It still exists under the name of the New England Company, and expends the revenue from its endowment funds for the education of Indians in the Dominion of Canada. All these efforts resulted in the formation of several villages of converted Indians in New England before progress was arrested by war. In the East Indies, on the renewal of the charter of the British East India Company in 1698, the duty was imposed upon the company of maintaining chaplains at its stations, and later the obligation to see that its native servants were instructed in Christian doctrine. Discussions regarding religious conditions in the company's stations led to the organization in 1698 of the Society for the Promotion of Christian Knowledge (S. P. C. K.), designed to provide Christian schools and books for neglected English communities. This was followed three years later by the organization of the Society for the Propagation of the Gospel in Foreign Parts (S. P. G.), designed to provide chaplains for the religious culture of Englishmen in foreign lands. Neither of these societies aimed at Christianizing the heathen. But the S. P. C. K. saved the Danish mission in South India from dying with its founder, and supported it for 100 years. It has also issued

Christian literature in the languages of various non-Christian peoples. As to the S. P. G., it gradually took up work among the pagans, and in 1913 it had 1291 missionaries and 3000 native workers in India, China, Japan, Malaysia, Africa, and the West Indies. In view of their later history, these two societies may be regarded as the earliest of the voluntary foreign-missionary societies of Great Britain.

2. *Protestant Voluntary Missionary Societies.*—In 1709 the state of the North American Indians led to the formation, in Scotland, of a Society for the Promotion of Christian Knowledge. The chief present importance of this society was its employment as a missionary (in 1744) of David Brainerd of Connecticut. The story of his brief life had persuasive influence on both sides of the Atlantic in stimulating similar devotion. A more powerful influence of the same nature was exercised by the writings and the example of the Moravian Brethren, who called themselves the Unity of Brethren. A remnant from persecution, this little people migrated from Bohemia and in 1772 found asylum in Germany. They were allowed to settle on the estates of Count Zinzendorf, who was himself a pupil of Francke of Halle and who became their leader. The Brethren established missions among the slaves of the West Indies, in Greenland, among the Indians of the North American Colonies, in South Africa, in South America, and in Labrador before the end of the eighteenth century. More recently they have opened missions in Australia, Alaska, and on the borders of Tibet. In 1900, all the Eskimos at their four stations in Greenland having become Christians, they transferred their Greenland mission to the Danish church. In their other fields they had in June, 1914, 367 European and American missionaries, 111 native missionaries, and 2059 native workers.

Through such influences and through the writings of Spener and Francke in Germany and the earnest exhortations of Whitefield and Wesley in England (who had themselves been deeply affected by the writings of Francke and Zinzendorf), and of Jonathan Edwards in America, a resuscitation of personal religion was brought about. At about the same time the travels of Captain Cook revealed the immense extent of the heathen world, while occurrences like the trial of Warren Hastings and the antislavery agitation of Wilberforce brought home to the minds of the English people their responsibility for outrages perpetrated by purely selfish men professing the name of Christians. The time was ripe for action to benefit the sufferers from such outrages. As early as 1779 the English Wesleyans sent a number of missionaries among the North American Indians, and in 1786 they began a mission in the West Indies. In 1814 these beginnings were followed by the organization of a society which has supervised the mission work of that church up to the present time. Its missions lie in Ceylon, India, South Africa, Oceanica, and China. In 1913 this society had in the field 695 missionaries of both sexes, aided by 4826 native workers. In addition there is the Wesleyan Methodist Women's Association, with 108 women missionaries aided by 320 native workers. In general, however, the sudden development of foreign-mission enterprises about the beginning of the nineteenth century did not come from any Church organization. It sprang from the awakening of isolated individuals whom the Church opposed as unsteady enthusiasts. In 1786 William Carey, a cobbler and a Baptist minister in England, surprised a ministers' meeting by proposing discussion of the duty of foreign missions. He was frowned down by his elders. In 1792, however, he commanded attention and won support. The duty had become plain. In that same year 12 men united to form the Baptist Missionary Society, sending Carey and Thomas as their first missionaries to India. The East India Company would not tolerate missionaries, but they found a safe residence in the Danish colony of Serampore, near Calcutta. The influence of the mission was immediate. Carey's greatest work was that of Bible translation; and the Serampore press, under his direction, added to the slender list then existing translations of Scripture in 34 languages. The Baptist society extended its work in India and added to its field Ceylon, the West Indies, West Africa, and China. In 1913 it had in the field 363 missionaries, men and women, with 905 native workers. The Baptist Women's Missionary Association had (1913) 90 women missionaries and 450 native workers. The example of the English Baptists had effect in all Protestant countries. The reading of Carey's first letters from India led in 1795 to the formation of the London Missionary Society (L. M. S.), in which Independents, Presbyterians, Methodists, and Episcopalians united. Since the other denominations have undertaken missions of their own, this society is now composed substantially of Independents alone. Its present fields are Oceanica, South and Central Africa, Madagascar, India, and China. In 1914 it had in the field 294 missionaries, men and women, and 7480 native workers. Nott, John Williams, Morrison, Medhurst, Rice, Moffat, and Livingstone are names which give special lustre to its roll. In 1796 two similar societies were formed in Scotland, which served at first as auxiliaries to the London society. Later they did good work by themselves in South Africa and the West Indies, and afterward became merged in the missionary societies of the Established church and the United Presbyterian church of Scotland. The formation of a society in Holland in 1797 (called the Netherlands Missionary Society), to aid in the work of the London society, illustrates the solidarity of Christian feeling which underlies the modern missionary movement, and also the failure at first to appreciate the extent of the work committed to a single board of directors by Christians of different denominations and nationalities. The Netherlands Missionary Society furnished several missionaries to the L. M. S., and afterward chose its special field in the Dutch East Indies, where in 1913 it had 65 missionaries and 135 native workers. From this beginning a score of other societies in Holland have sprung for direct and indirect foreign-missionary work. Meanwhile the claims of freed slaves at the Sierra Leone colony were pressed upon the Church of England. Pious men in the employ of the East India Company, like Brown and Grant, urged that church to labor among the people of India. Nothing being done by the church in 1799, 26 of its spiritually minded members, among whom were William Wilberforce, John Venn, and Charles Simeon, organized the Church Missionary Society (C. M. S.), at first known as the Society for Missions to

Africa and the East. They at once encountered opposition on the ground that such enterprises should be directed by the bishops, which made it difficult for them to find fit ministers to go out. Hence the society drew its early missionaries from Germany. Altogether more than a hundred of its missionaries have been Germans, many of them of the highest ability, like Krapf, Rebmann, Rhenius, and Pfander. Nearly half a century passed before the C. M. S. won recognition from the episcopate. The fields of the C. M. S. are in India, Ceylon, China, Japan, West Africa, East Africa and Uganda, Mauritius, Arabia, Persia, Palestine, Egypt, Sudan, and the northern and western parts of British North America. In 1914 it had in the field 1340 missionaries, men and women, and 10,325 native workers, of whom 454 are ordained clergymen. The growth of English interest in missions, combined with the successes of the Halle missionaries of India, led in 1800 to the establishment at Berlin of Jannicke's Missionary School. This school during the next quarter of a century furnished some 80 missionaries to the English and Dutch societies, and served to arouse further interest in missions in Germany. Meanwhile the same ideas were working in America. They found expression in foreign missions through the devotion of Samuel J. Mills and other students at Williams College, who agreed together to give their lives to preaching to the heathen. The earnestness of these young men led to the formation, in 1811, of the American Board of Commissioners for Foreign Missions (A. B. C. F. M.), an interdenominational society. The first missionaries of this society, Newell, Judson, Hall, Rice, and Nott, were sent to India, and were instantly ordered out of the country by the East India Company. Judson and Rice joined the Baptists at Serampore, and the others after some trouble succeeded in getting a footing in Ceylon and at Bombay. Within 10 years the society had occupied other fields in India, in Hawaii, and in Turkey. After some 40 years of existence as an interdenominational society it relinquished some of its fields in India, Persia, Syria, and West Africa to the American Dutch Reformed and Presbyterian churches, who wished to conduct separate missions of their own. It is now supported chiefly by Congregationalists. The A. B. C. F. M. has missions in China, India, Ceylon, South Africa, West Africa, Japan, Turkey, and Oceanica. In 1912 the number of its missionaries, men and women, was 615, with 4999 native workers. Judson and Rice, of the first group of missionaries sent to India by the A. B. C. F. M., changed their views on baptism before entering upon their work, and chose Burma for their field of labor. This occurrence led in 1814 to the formation of the American Baptist Missionary Union (A. B. M. U.) to assume the support of the two pioneers in Burma. Its present fields are in Burma, Siam, Assam, India, China, Japan, the Philippines, and the Congo Free State. In 1913 it had in the field 701 missionaries of both sexes, with 8589 native workers.

The success of the early missionaries of these English and American societies aroused an interest which extended to the Protestants of the continent of Europe and led in 1815 to the establishment of a missionary institute at Basel in Switzerland. The training school for missionaries with which this institute began its operations provided valuable men for the English societies. A magazine for missionary intelligence, published by the institute, deepened missionary interest in Germany and other Protestant countries. In 1822 the Basel institute began to send out missionaries, one of the earliest of whom, Zaremba, labored effectively in Russian Armenia until expelled by the Russian government in 1835. Its present fields are in West Africa, India, and China, and graduates of its school are pastors of evangelical churches in Turkey. In 1913 it had in the field 442 missionaries, men and women, with 1911 native workers. The land of Luther had already contributed men and means for foreign missions during many years before its first foreign-missionary society was formed at Berlin in 1824 by 10 men of mark, among whom were Neander and Tholuck. Following the conservative usage of the continental Protestants, the first work of the Berlin Missionary Society was to establish a training school for missionaries. It began to send men abroad in 1834. Its present fields are in South Africa, German East Africa, and China. It has also done much to draw Christian colonists to the German colonies. In 1912 it maintained 181 men as missionaries in its various fields, with 1339 native workers. During the first part of the nineteenth century a considerable number of little missionary associations had been formed in different parts of Germany to aid existing societies at Basel and elsewhere. Later these developed into the Rhenish, the North German, the Leipzig, the Gossner, and the Hermannsburg Missionary Societies, and have finally won the support of the official representatives of the Church to what is now a large and important missionary enterprise in Africa, India, China, Malaysia, and Australasia. The foreign missions of the Protestants of France began in 1818 with a missionary magazine intended to give information of the work of missionaries of other nations. This was followed in 1824 by the organization of the Evangelical Missions Society of Paris, designed at first to aid existing missions. Since 1825 it has sent missionaries of its own to Central Africa and Senegambia, besides replacing, in consequence of French national prejudices, missionaries of the L. M. S. in Tahiti and Madagascar and American missionaries in the French Congo region. It had, in 1914, 119 European missionaries in its service. The roots of the existing missionary societies in Denmark, Norway, and Sweden also lie in the first quarter of the nineteenth century. These Scandinavian societies expanded during the last quarter of the century, and in 1913 they had 287 men and 395 women missionaries, assisted by 2858 native workers, in Africa, Madagascar, India, China, and Chinese Turkestan. The intimate relations of some of the Scandinavian societies with German, English, and American enterprises, however, make it certain that some of these missionaries are also reported by societies in other countries. In 1824 the Established church of Scotland undertook missionary work in India and among the Kaffirs in Africa, one of its early missionaries being Alexander Duff, the father of educational missions. The disruption in 1843 caused the resignation of all the Scotch church missionaries in India and Kaffraria, they preferring to join the Free church, which has since carried on extended missionary operations. In

1900 the Free church joined with the United Presbyterian church in forming the United Free church of Scotland. This body has missions in India, Africa, Arabia, Syria, Turkey, China, West Indies, and the New Hebrides. It had, in 1913, 545 missionaries, men and women, and its force of native workers is 2842. As to the Established church of Scotland, after recovering from the effects of the disruption, it pressed its missionary enterprises, and in 1913 it had in India, Central Africa, China, and Turkey 116 missionaries of both sexes, with 244 native workers. These Scottish mission enterprises are carried on by the Church organizations, and not by independent missionary societies.

The Bible societies grew out of the same religious quickening which gave rise to the voluntary missionary societies (the British and Foreign Bible Society, 1804, the American Bible Society, 1816, the Netherlands Bible Society, the Scottish National Bible Society, and others). So far as concerns their publications in the languages of non-Christian peoples these societies do foreign-missionary work in the very highest sense, since no Protestant foreign mission can exist without the Bible in the language of the people among whom it is working. The Bible societies work in harmony with each other and with the missions. Indeed, missionaries have made the greater part of the translations of the Bible now in circulation. The Bible or parts of it existed in 1914 in almost 600 different forms of speech. The British and Foreign Bible Society has a list of 474 different languages. The Religious Tract Society of London (1799) and the American Tract Society of New York (1820) have done a similar work for foreign missions in aiding to provide general Christian literature in the languages of non-Christian lands.

While our survey indicates the origin of the Protestant missionary movement in the spiritual enlightenment of the Christian Church, it cannot detail its expansion since the first quarter of the nineteenth century. In the second quarter of the century the Methodist church and the Presbyterian church in the United States, previously occupied with missions among the American Indians, began their great missionary enterprises abroad. In many other denominations in the United States, Great Britain, and Europe, foreign-missionary undertakings have been organized. Since the middle of the century foreign-missionary societies have been formed in the colonial churches in Canada, the West Indies, India, Australia, New Zealand, South Africa, and other Protestant colonies. Since 1861, when the first Woman's Foreign Missionary Union was formed in New York, Christian women in all lands have entered upon the work, organizing women's missionary societies, commonly more than mere auxiliaries to the older enterprises. Educational and medical missionary enterprises have been established in considerable number. Interdenominational missionary societies, like the Christian and Missionary Alliance of America and the China Inland Mission and the North Africa Mission of England, have undertaken extensive enterprises in non-Christian countries. To some extent Christian communities which are themselves the fruit of missions have undertaken foreign missions; as in India, Africa, the Fiji Islands, the Hervey Islands, and Hawaii. In India, Ceylon, and South Africa the Salvation Army has established itself, seeking to forward the evangelization of the heathen by methods peculiar to itself. The Student Volunteer Movement, organized in 1886 in America, but now found in many other lands has done much for the increase of mission interest among students. In 1914 the various missionary societies united in the formation of a Board of Missionary Preparation. Missions have fostered a sense of Christian unity. In India, China, and Japan, and in some other countries, interdenominational conferences of missionaries are regularly held. In south India and Japan union churches have been formed. In the Netherlands, in Germany, in the United States, and to some extent in Great Britain, conferences between the various Protestant missionary societies are held at regular intervals. General and international missionary conferences have been held, of which the last and most important was held at Edinburgh in 1910.

3. *Methods and Problems of Foreign-Mission Work.*—As to the methods used in the presentation of the gospel experience has developed certain principles, almost attaining to the quality of a science of missions. Preaching in the language of the people is the first and most important method of evangelization; and the establishment of a permanent preaching place, to which all may come if they choose, is a first concern in every missionary station. Need at once appears to place the Bible in the hands of the people. This fixes literary work as another method of evangelization. Qualified missionaries translate the Bible, set up presses and print it, prepare helps to its study, tracts, and general Christian literature, and in short apply the enormous influence of the printing press to the enterprise of making Christ known. In 1913 the British and Foreign Bible Society published 1,170,000 Bibles and portions in India and Ceylon, 2,183,000 in China, 300,000 in Africa, and 633,000 in the Japanese Empire. The American Bible Society in the same year printed 29,579 Bibles, 134,689 Testaments, and 2,573,120 portions abroad. Desire that the people shall read requires not only the printing of primers, but the establishment of schools. But every school gives unsurpassed facilities for moral and spiritual culture, and this in proportion to the importance of its general training. Hence educational work has an importance as a method of evangelization which is immeasurable where the quality of instruction is of the best and the spiritual power of the teachers is of the highest. In 1910 there were, under the direction of Protestant missionaries, 30,300 primary schools and kindergartens, with 1,295,954 pupils of both sexes, and 2624 higher educational institutions, with 204,128 students; 86 of the last-named institutions are universities and colleges attended by 8628 students of both sexes. Theological and normal schools and training classes had 12,761 enrolled in 1910; boarding and high schools, 166,447; industrial training institutions and classes, 16,292. Medical work is another powerful method of evangelization. Protestant foreign missions in 1910 possessed 576 hospitals and 1077 dispensaries, in which 4,235,375 individuals received treatment during the year. A most pervasive method of evangelization is consistent Christian living. This includes not only Christian family life, which in itself is an object lesson for non-Christians, but also social intercourse with the people and a

wide variety of works of philanthropy, both in times of famine and pestilence and in the daily contact of ordinary life.

As soon as converts have been won, there arises the problem of their organization and culture as a body having self-control, initiative, and the power of expansion. The results of missionary work cannot be permanent unless the Christian Church becomes indigenous on the foreign field. Hence the members of native churches must early be accustomed to manage their own affairs and to support their own church institutions and their schools. Missionaries rarely become pastors of the local churches, and in general avoid settling local ecclesiastical questions except in conjunction with the local ministers.

Whatever the ability and common sense of the missionary, attack is probable upon him by vested interests represented in the religion of the country where he would preach. The murder, during 1900, of 135 British, Swedish, and American missionaries in China was a tragedy of missions more than once paralleled in quality, though not recently in degree. In this connection a problem arises as to the right of missionaries to ask government protection. It is generally held that missionaries should not depend upon such protection; that they go among savage tribes at their own peril, and that in lands where laws and treaties exist they must obey the laws. On the other hand, a government jeopardizes the right of all its people residing in any foreign country when it neglects to defend such of them as are maltreated while engaged in lawful occupations.

4. *Results of Missions.*—General statistical tables of Protestant foreign missions are seldom perfect. Nevertheless, the following figures may be taken as a fairly accurate statement of the activities of the various missionary societies operating from the countries named for the year 1914.

COUNTRIES	Stations and outstations	Men and women missionaries	Native laborers	Communicants	Added last year	Under instruction	Income
United States	14,802	6,282	39,825	972,655	110,194	†450,158	$11,549,390
Canada *	461	509	796	15,582	1,061	6,969	563,998
Great Britain and Ireland	19,495	7,158	43,002	720,572	36,355	844,848	9,615,032
Continental Europe	6,917	3,411	15,753	542,482	20,685	304,473	3,374,956
Total	41,675	17,360	99,376	2,251,191	168,295	1,606,448	25,103,176

* For 1910.

† Including teachers.

Again, foreign missions have not merely planted Christianity in all the principal non-Christian lands of the world; they have added the Bible to the literature of all the great languages of the earth, placing before the eyes of the people the principles of true manhood and its model in the peerless figure of Jesus Christ. The British and Foreign Bible Society in 1913 issued a total of 8,958,233, the American Bible Society 5,251,176, and the National Bible Society of Scotland a total of 2,697,886 Bibles, Testaments, and other parts of Scripture. Results of missions visible to the eye in non-Christian lands, but not capable of record in statistics, are the overthrow of degrading superstitions, the limitation or extinction of immoral and cruel customs, the modification of non-Christian religious teaching, the gradual elevation of the standing of woman, the quickening of general intelligence, and the wide introduction of education among illiterate and degraded races, together with the addition of great territories to the area of the world's commerce. To this must be added the work done by missions in charitable care for the sick, the blind, the lepers, and outcasts of every class.

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B. **Roman Catholic Foreign Missions.** 1. *Central Administration. The Congregation of the Propaganda.*—In a general way the direction of all Roman Catholic missions is vested by the holy see in the Roman congregation De Propaganda Fide, established in 1622 for Roman Catholic missions by Gregory XV. It consists to-day of 25 cardinals, with a cardinal prefect as their head, and a number of prelates and consultors in charge of the various details of administration. The congregation has at Rome its own palace or bureau, a college, a library and museum, a polyglot printing press, and certain fixed revenues, chiefly from domestic or Italian sources. The various missions are distributed by it according to the character of its subjects and the nature of the religious orders to which they belong. It settles finally all disputes between missionaries, whether they regard territorial jurisdiction or the conduct of the missionary work. The regular reports made by missionary bishops or superiors to the holy see pass through the congregation, and in general it acts as agent for missionaries in all matters that regularly pertain to other Roman congregations; e.g., questions of Tridentine law, marriage and divorce, criminal questions, and the like. Its principal meeting is on the first Monday of every month. A weekly meeting is regularly held for minor matters. Among the most important attributes of this congregation is the selection of bishops. Where there is a regularly established hierarchy, a list of three names is submitted to the Propaganda with all the documents pertaining thereto. These candidates are discussed in the regular monthly assembly of all the resident cardinals, and he who seems the most worthy is proposed to the Pope. This privilege of recommendation, in whatever way it be exercised, differs entirely from the election of a bishop, which belongs to cathedral churches by virtue of the regular canon law. In some countries, as in Canada, and formerly in the United States, the provincial bishops alone recommend the three candidates. In other countries, as in England, Scotland, and Ireland, the clergy or the chapter (i.e., the canons of the cathedral), as the superior part of the clergy, draw up a list which the bishops of the province confirm with their approbation or reject with animadversion on one or the other or all of the candidates. Elsewhere, as in the United States since 1884, and in Australia, the clergy or representative part of the clergy recommend three names to the bishops of the province, who in turn recommend these or others to the holy see. When there is no regular hierarchy vicars apostolic are appointed, with episcopal character, from a list of three names drawn up by the superiors of the religious institute or order to which the care of the faithful has been already committed. In the absence of such action the Pope appoints a vicar apostolic on recommendation of the Propaganda. On account of the rapid growth of Catholicism, chiefly in English-speaking countries, the office of Cardinal Prefect of the Propaganda has become one of the most important and responsible of the great curial offices; he is often called the Red Pope.

The College of the Propaganda is an institution attached to the congregation for the purpose of training its missionaries from their very youth. It owes its first beginnings to the Spaniard John Baptist Vivés, who bequeathed to it his palace at Rome and made it his heir. Since 1622 the original foundation has been greatly enlarged. Urban VIII was a notable benefactor of the work (1641); hence it bears the name of Collegium Urbanum. Some canons of the Lateran Church were the first teachers of the young missionaries, but the college soon passed into the complete control of the new congregation. It was endowed with many privileges by the popes. They exempted it from all ordinary ecclesiastical and civil jurisdiction, and several special distinctions were granted it, among others the right of giving degrees in theology and philosophy. Its present quarters were designed by Bernini, and the chapel is the work of Borromini. Seven months after their entrance the candidates for the missions are required to take an oath of obedience to the congregation; among other things they promise to go directly to their respective missions after ordination. Those who remain as missionaries in Europe (e.g., in the British Isles, the northern kingdoms, Switzerland) are required to report annually to the prefect of the congregation; those whose missions are elsewhere must write to him biennially. Not a few candidates, especially from the Orient, come at an early age. Such youths do not take the missionary oath until after they have reached their fourteenth year. In this college the training is the usual seminary training. Only, for the beginners, Greek and Latin, and especially the suitable Oriental languages, make up the curriculum. The college owns near Rome its own country seat or villegiature, whither the students go during the heated season. On Pentecost one of the students of the college preaches before the Pope and the cardinals. Its students at the end of the eighteenth century were about 140; at present they do not exceed 120. The French Revolution caused it to close its doors; but since 1809–17 it has been opened for its former work, and many distinguished men have graduated from its classes. From 1836 to 1848 the teaching and discipline were under the control of the Jesuits. Since then they are provided for directly by the congregation itself, which names a rector and vice rector with other officials, and provides for the programme of studies. Several national colleges attend the lectures of its professors—thus, the North American, Canadian, Irish, Greek, Ruthenian, and other national ecclesiastical schools frequent its classrooms. Yearly an Accademia Polyglotta is held on the first Sunday after Pentecost. Discourses, poems, and addresses are then read in a great variety of languages, chiefly Oriental, and the ceremony is graced by the presence of many dignitaries of the Roman court. Lately new and commodious quarters have been secured for the academic needs of the college.

The congregation has long owned and managed a printing press that is unique on account of the many kinds of type it possesses for the Oriental languages. In the last two centuries a multitude of Oriental texts have come from its offices—liturgical, ascetic, literary, theological, patristic, historico-religious. There is perhaps no-

where else in the world an Oriental printing press so well equipped and so scientifically conducted. It issues regularly a catalogue of its publications, and is officially known as the Stamperia de Propaganda Fide.

The Congregation of the Propaganda governs all Catholic missions according to the general law of the church, the decrees of the Council of Trent, the decisions of other Roman congregation, the papal rescripts, and the conciliar legislation. But over and above the ordinary law there is a certain amount of special legislation for the missions and missionaries. As early as 1669 the Propaganda issued its *Advice to Missionaries*, that has been lately reprinted (*Monita ad Missionarios*, Rome, 1874). The details of its extensive legislation are to be found in the collection of its document known as the *Bullarium* of the congregation (Rome, since 1839, 5 vols., folio; with an index, 1858). Another collection is that of Raphael de Martinís (7 vols., folio, Rome, 1889–1900). The particular legislation of the Propaganda affecting the Oriental missions is found in the work entitled *Collectanea Constitutionum, etc.* (Paris, 1880) and in the *Apparatus Juris Ecclesiastici* of Zephyrin Zitelli (Rome, 1886). Occasionally the congregation issues a legislation that modifies the regular canonical procedure in justice, e.g., in the trial of matrimonial cases, clerical delicts, and other judicial processes. Such documents then become norms of ecclesiastical government in the land for which they are issued. The current public documents of the congregation may be easily found in the Roman canon law periodical entitled *Acta Sanctæ Sedis*, and those of the Pope in the annual series of pontifical documents respectively known as *Acta Pii IX*, *Acta Leonis XIII*, *etc.*

Usually the establishment of a remote and difficult mission begins with the sending of a prefect apostolic by the Pope, at the suggestion of the Congregation of the Propaganda. As a rule this missionary is only a priest, but he receives certain special authorizations from the holy see, e.g., the right to administer confirmation. As soon as the conditions of the mission warrant, a vicar apostolic is appointed to take charge of its interests. Such a missionary is made a titular bishop, i.e., he is given the "title" of some see extinct or suppressed. No specific seat of residence is fixed for him; he organizes the mission as best he can. In time sees are established with territorial limits, and canonical obligation of residence for the bishop; thus a quasi-normal condition arises in which the administration of spiritual affairs gradually grows quite like that of the older Catholic states of Europe, and the regular ecclesiastical law tends to obtain as against the temporary and opportunist administration of an earlier date. Nevertheless, for various reasons, the holy see often continues to govern such well-developed churches through the Congregation of the Propaganda, instead of incorporating them in the ordinary system of its administration. The Propaganda is thus one of the busiest of the Roman congregations. There come before it all questions that arise in missionary lands concerning the creation of dioceses, their dismemberment, division, union, and transformation; the nominations to episcopal office; the relations, in last resort, of bishop and clergy; all questions between bishops and religious orders, and between orders themselves in matters of their mission work; the discipline and supervision of national missionary colleges, theological seminaries in missionary lands; the regular reports of its bishops, their special needs or plans, and similar things. It is in close contact with all other Roman congregations, to which it acts as a kind of clearing house for the missions and missionaries. Its juridical decisions are final, authoritative, and reversible only by the Pope, to whom they are always submitted beforehand when the gravity of the occasion or the nature of the problem in question warrants. The congregation has a permanent secretary, generally an archbishop, who goes weekly to the Vatican with the proceedings of the congregation, to submit them to the approval of the Pope and give such explanations as are needed. This office is looked on as "cardinalitial," i.e., as leading directly to the dignity of cardinal—hence it is always filled by an ecclesiastic of learning and experience.

A large and valuable library is connected with the congregation, for its own use and for the needs of the college and the printing press. It is especially rich in ancient theology and philosophy, and in all kinds of Orientalia, both printed and manuscript. It is accessible to students and writers. The archives of the congregation are kept with care, and are of great value for the ecclesiastical and civil history of the missionary lands. They are partially accessible under certain conditions, and are now being used by historians of the sixteenth, seventeenth, and eighteenth centuries, especially for the period of the Counter Reformation in Germany, Switzerland, and the Netherlands.

Until 1862 the affairs of all the missionary churches, East and West, were treated in one and the same Congregation of the Propaganda. In that year Pius IX established a special section of the congregation for the administration of the Oriental churches (Sacra Congregatio pro Negotiis Ritus Orientalis). It has its own chief, a Cardinalis Ponens, and its own officials and counselors. To each curial (resident) cardinal of this section is allotted the conduct of the religious affairs of some one of the Oriental rites united with the holy see; he is called the Cardinalis Relator.

2. *National and Particular Direction.*—The principal national missionary enterprises of Roman Catholics are carried on from Paris and Lyons in France. The most venerable of them is the Seminary for Foreign Missions (Missions Etrangères), founded at Paris, 1658–63, and located in the Rue du Bac. Its missionaries are under the guidance of local superiors (bishops) throughout China, Chosen (Korea), Tibet, Turkey, Siam, Burma, and Hindustan. In the seminary is a curious and touching Musée des Martyrs. The annual departure of its missionaries from Paris gives occasion for a remarkable popular ceremony and demonstration. The Society for the Propagation of the Faith (Œuvre de la Propagation de la Foi) was founded in Lyons in 1822 by a few pious lay persons. Its object is not to train or send out missionaries, but to collect and distribute for missionary purposes funds received from private generosity. This distribution is carried out without distinction of location or nationality, a principle which from the beginning differentiated this organization from previous enterprises of a similar nature. The receipts for the year 1822 were scarcely $4000. In 1898 the association collected nearly seven millions of francs and the total

amount raised by the society in the various countries (France being always far in advance of the others) from the beginning down to 1912 was $80,349,653. By 1915 it had amounted to $83,634,380. The society was established in the United States in 1840, and down to 1912 had collected $3,031,129. Up to 1915 the society had spent $6,478,714 in the United States. The means adopted for the raising of funds is the payment of five cents per month by the members enrolled in the association. The Work of the Holy Childhood (Œuvre de la Sainte Enfance), a related enterprise, has collected and spent about $10,000,000. Other French associations for missionary help are the Work of the Oriental Schools, the annual collection on Good Friday for the Holy Land, the Work of the African Missions, the Anti-Slavery Association, the White Fathers, the Fathers of the Holy Ghost —all works established originally in France and extended to different parts of the world.

There are many religious orders and institutes in France which send numerous members to the mission fields; thus, there are some 800 French Jesuits in the Orient, and they carry on excellent colleges at Beirut, Cairo, and Alexandria. Similarly Lazarists, Dominicans, Assumptionists, and others have numerous missionaries scattered through the Orient. The Christian Brothers have many well-attended schools in Egypt, Syria, Asia Minor, at Constantinople, and in the Levant. Owing to colonial expansion, Catholic Germany has shown more interest in missions during the last three decades, though the earlier French "Works" always found sympathy in Germany. The Bonifacius-Verein (1849) for home missions has spent in the 65 years of its existence over $7,000,000. The Ludwigs-Verein (1839), the Leopolds-Verein (1839), the Afrika-Verein (1894), the Association for the Holy Land (1893), and other enterprises have kept alive the zeal of German Catholics for the conversion of the heathen. A large number of the German Catholic missionaries are Jesuits. Within the last decade an increasing German missionary activity is manifest, especially in China and Brazil, in which latter country the German colonists increase at a rapid rate.

The French "sisterhoods" give generously of their members to the Oriental missions. Most of the missionaries to the credit of Catholicism are Frenchmen; a still larger proportion of the Catholic "sisters" on these missions is made up of Frenchwomen. Perhaps 10,000 is not too high a number. Of the entire number of congregations of men and women that labor in Catholic missionary fields, over 80 are of French tongue or have their home in France.

While the Spanish missionaries have nearly all taken their way to the Philippines, the Italian missionaries carry on, in an hereditary way, certain lines of work in the Orient, notably in the Levant. Statistics of their number and work are not easily reached. The Salesian Fathers (Turin) of Don Bosco turn their energy towards South America, and the society founded by Bishop Scalabrini, of Piacenza, is especially interested in the Italian population of South America and the North American cities. Holland has had a house for foreign missions at Steyl since 1875, with about 120 missionaries. At Mill Hill, in England, the English Catholics support a seminary for missions among the blacks. The College of All Hallows at Dublin draws its missionaries from Ireland; many of them come to the United States and merge into the American clergy; Ireland makes provision also for a few missions in Africa and India.

As to the civil relations of the Catholic missions in the Orient, France was their official intermediary with the local governments until the separation of church and state in France, Dec. 9, 1905. This ancient privilege was recognized by late acts of the Prefect of the Propaganda and the Holy Father. It was also recognized anew by the Chinese Emperor in March, 1899. Among the notable acts in the history of Oriental Catholic missions was the establishment by Leo XIII of a regular hierarchy in India (1886) and in Japan (1891).

The support of Catholic missions comes almost entirely from private sources. The money salary of each missionary is a very modest one. The Work of the Propagation of the Faith at Lyons allots annually from $100 to $120 to each missionary that it supports. Nearly all the money comes from small contributions, but through a well-organized system of collection.

There are in all some 55 Catholic orders and societies engaged in missionary work, ranging in date of foundation from the Benedictines in 529 to the Foreign Missionary Society of Turin in 1900. Among those most prominently engaged in missionary activities are the Benedictines, Cistercians (Trappists), Dominicans, French Foreign Missions, Minor Franciscans, Capuchin Franciscans, Jesuits, Lazarists, Mazarists, and Oblates of Mary Immaculate. In addition there are over 30 orders of brothers and 175 orders of sisters engaged in mission work as auxiliaries to the missionary priests. There are some 12,000 priests, 4000 teaching brothers, and 40,000 sisters. The entire force of workers in the Catholic missions field now numbers over 60,000.

3. *Some Important Events and Facts in the History of Modern Roman Catholic Missions.*— As a result of the loss of its East Indian possessions the crown of Portugal became involved, during the last century, in long and serious conflict with the holy see. From 1834 to 1838 the latter cut off from the original Portuguese archdiocese of Goa four vicariates apostolic, that coincided with English territory. Though absolutely just and necessary, this act of Gregory XV was resented by Portugal. A schism followed which lasted more or less acutely and continuously until 1886, when peace was brought about by Leo XIII. Goa was made a titular patriarchate with four suffragans, Damão, Archbishop also *ad honorem* of Crangaror, Cochin, St. Thomas of Meliapur, and Macao. Elsewhere in India the former vicariates apostolic of Agra, Bombay, Varapoli, Calcutta, Madras, Pondicherry, and Colombo (Ceylon) were raised to the archiepiscopal rank and freed from all subjection to the archbishopric of Goa.

During the whole nineteenth century the Catholic missions in Tongking and Annam suffered very frequently from popular uprisings and government persecution, until the establishment of the French civil protectorate in 1885–86.

Until 1880 the Catholic missions in Korea were almost continuously the object of similar maltreatment; nevertheless, there was in 1912 a total of 52,109 native Catholics, with 129 chapels and churches, 35 foreign and 10 native priests, and 7 foreign lay brothers. There were also 10 foreign and 57 native sisters. The present religious toleration in Korea under Japanese rule

was unknown in early days. In 1839 three French bishops were put to death as martyrs, and in 1860 nine bishops suffered the same fate.

The modern Catholic missions in Japan began tentatively in 1832–58. An impetus was given by the discovery of a number of crypto-Catholics (1858–72), who had retained some souvenirs of the faith as preached to their ancestors in the sixteenth and seventeenth centuries. With the gradual enlargement of religious liberty since 1872, the disestablishment (1886) of Shintoism and Buddhism, and the proclamation of a constitutional monarchy (1889), the conditions have been more favorable for the Catholic missions. In 1891 Leo XIII established a regular hierarchy in Japan, with one archbishop at Tokio. The three suffragans are at Nagasaki, Osaka, and Hakodate. In Japan (including Korea) in 1912 there were 202 foreign and 48 native priests, 140 lay brothers, 303 sisters, 400 churches and chapels, and 144,984 Catholics.

The labors of the Catholic missionaries in China during the last century were largely directed to gathering back into the Christian fold the families scattered by the former persecutions. The opium war, the Taiping Rebellion, political manœuvres, the weakness of the central authority, and the native hatred of the Chinese for "foreign devils" caused the destruction of many promising Christian communities in spite of the treaties of 1844 and 1850. One cause of the Boxer Rebellion of 1900 was fear of the political activities of the Catholics, especially the French orders, who were more or less supported by the French government. The present constitution of the Chinese Republic grants absolute freedom to all religions. In 1912 there were in China (including Manchuria, Mongolia, and Tibet) 1365 foreign and 721 native priests, 247 foreign and 86 native lay brothers, 743 foreign and 1429 native sisters, 9214 churches and chapels, 7131 schools, 134,057 scholars, and a native Catholic population of 1,406,659.

In Central Africa the most important events have been the labors of Father Libermann and his society (Fathers of the Holy Ghost) since 1840 and the foundation of the Pères Blancs of Cardinal Lavigerie. The African missions have been helped lately by the formation of anti-slavery societies. Among the most remarkable of Catholic missionaries in Africa was Father Daniel Comboni. In Ethiopia the central figure has been the late Cardinal Massaia, a venerable Capuchin, who devoted 30 years of his life to the work. In French Africa the see of Algiers was founded in 1838, and in 1867 became an archbishopric, with Constantine and Oran for suffragans. The French protectorate over Tunis (1881) brought with it, in 1884, the restoration of the famous ancient see of Carthage. Since 1885 the French protectorate over Madagascar has affected somewhat favorably the Catholic missions among the Malagasies.

According to Streit, *Atlas Hierarchicus*, the statistics of Africa for 1912 are as follows: for northeast Africa, 266 foreign and 80 native priests, 400 brothers, 1067 sisters, 190 churches and chapels, 180 schools, 20,557 scholars, and 138,018 Catholics. For northwest Africa, 427 foreign and 5 native priests, 141 brothers, 339 foreign and 27 native sisters, 334 churches and chapels, 564 schools, 40,992 scholars, and 125,300 Catholics. For Central Africa, 810 foreign and 3 native priests, 361 foreign and 14 native brothers, 446 foreign and 31 native sisters, 2426 churches and chapels, 3306 schools, 125,449 scholars, 6410 European and 332,696 native Catholics. For South Africa, 387 foreign and 4 native priests, 360 brothers, 1672 foreign and 22 native sisters, 358 churches and chapels, 363 schools, 28,042 scholars, and 103,880 Catholics. For the African Islands, 188 foreign and 2 native priests, 109 brothers, 195 sisters, 1267 churches and chapels, 182 schools, 32,499 scholars, and 15,300 Europeans and descendants and 223,504 native Catholics. Total for Africa, 2074 foreign and 94 native priests, 1385 brothers, 3819 sisters, 4575 churches and chapels, 4595 schools, 247,589 scholars, and 945,088 Catholics out of an estimated total population of 140,868,051.

As regards British India, the same authority from whom all of these statistics are taken gives the number of foreign priests as 1268, with 1230 native priests, 638 lay brothers, 3592 sisters, 5891 schools and chapels, 3362 schools, 211,035 scholars, and 2,215,632 Catholics. For Asia Minor the figures for 1912 were 527 foreign and 59 native priests, 595 foreign lay brothers, 1187 sisters, 447 churches and chapels, 823 schools, 60,114 scholars, and 138,200 Catholics. For the Philippine Islands the Catholic population is given as 7,455,714, with 963 parish priests, 782 other priests, 29 houses with 559 priests and 195 brothers, 43 houses with 696 sisters, 1339 churches and chapels, 14 seminaries, 32 higher schools, and 10,040 scholars of all kinds. As regards the East Indian islands, in 1912 there were 101 foreign and 2 native priests, 41 brothers, 425 sisters, 112 schools, 9707 scholars, and 37,707 converts, with 180 churches and chapels. In Indo-China the foreign priests numbered 517, with 689 native priests, 149 brothers, 2841 sisters, 4018 churches and chapels, 2986 schools, 73,894 scholars, and 986,597 Catholics. In the Turkish Empire in 1912 the Armenian Catholics numbered 106,000, with 367 bishops and priests; the Syrians 22,200 Catholics and 84 priests, the Syrian Chaldean 64,000 with 251 and the Syrian Maronites 414,600 Catholics with 1517 bishops and priests.

In South America there are nearly 10,000,000 Indians in the various Catholic missions, with some 3,000,000 more unconverted. The separation from Spain, the abolition of slavery in Brazil (1888), the frequent violent expulsion of various religious orders, the movement of immigration from Europe, and the Patagonian missions of the Salesian Fathers since 1875, have been among the principal events that affected the missionary work.

Throughout the islands of Polynesia there were, in 1912, 427 European and 8 native priests, 227 European and 29 native lay brothers, 418 foreign and 120 native sisters, 900 churches and chapels, and a total Catholic population of 193,293.

In 1885 Archbishop Moran, of Sydney, was made a Cardinal and in the same year he held the first council in Australia. There was in Australia in 1912 a total of 828,111 Catholics, 1505 churches and chapels, 1436 various priests, 478 brothers, 5574 sisters, 1181 schools, and 115,178 scholars. In Tasmania and New Zealand there were for the same year 184,876 Catholics, 419 churches and chapels, 388 priests of various kinds, 75 brothers, 164 sisters, 195 schools, and 17,465 scholars.

The most active missionary body of the Roman Catholic church is the Society of Jesus. A quasi-

official statement found in the *Lettres des missionnaires jésuites* (Paris, 1903) gave the number of Jesuit missionaries at that time as 3249. In 1912 they included in their organization 1 cardinal, 11 bishops, 7 apostolic vicars, 7311 priests, 4229 scholars, and 3977 lay brothers. They are active in almost the entire field of missionary work. They are no longer officially sanctioned in France since the separation of church and state, Dec. 9, 1905.

4. *Mission Work in the United States.*—Home-missionary activity in the United States aims chiefly at supplying the spiritual needs of the Indians and negroes. These missions are almost exclusively in the hands of religious orders. In 1885 a special commission was organized to collect and distribute funds for the maintenance of missionaries and schools in the various reservations. Statistics of 1912 claim 64,741 Catholic Indians, with 306 churches, 163 priests, 101 schools, and 7357 scholars; 103,436 Catholic negroes, with 109 churches, 162 priests, 173 schools, and 14,181 scholars.

Another phase of missionary endeavor in the United States is that of missions to non-Catholics inaugurated by the Paulist Fathers in 1893. It consists in explaining by public conference Catholic belief and practice to those non-Catholics who may desire to be enlightened thereon. The idea was soon taken up in various localities, many bishops setting apart a few preachers to carry on this work in their respective dioceses. The movement soon led to the formation of a legal corporation known as the Catholic Missionary Union, and in 1903 to the erection of the Apostolic Mission House in Washington, D. C. This institution is one of the group of those connected with the Catholic University, and its aim is to train young clergymen in missionary methods with a special view to this diocesan work.

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MISSISAGA, mĭs'sĭ-sä'gȧ *or* -są'gȧ. An Algonquian tribe of North American Indians residing east and south from Lake Ontario, Ontario, Canada. They are closely connected with the Ojibwa, of whom they are an offshoot. The name is said to mean "great mouth," referring to the mouth of the Missisaga River. When first known to the French, early in the seventeenth century, the Missisaga were living upon the lower part of the river which bears their name and upon the adjacent Manitoulin Island. Soon afterward they moved east and south into the country left unoccupied by the dispersion of the Huron and Ottawa and soon spread over the whole peninsula of Lower Ontario. At the close of the Revolution they even had one village on the south side of Lake Erie in what is now Ohio. The land on which the Iroquois are now settled on Grand River, Ontario, was bought from the Missisaga. On account of the former loose distinction between the Missisaga and Ojibwa, it is impossible to give exact figures of population. Those now officially classed as Missisaga number about 750, on small reservations at New Credit, Alnwick, Mud Lake, Rice Lake, and Scugog, Province of Ontario, Canada. They are all members of the Methodist church and support themselves by farming, fishing, trapping, gathering wild rice, basket making, and outside labor.

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